Drinking Water Quality in Northern Ireland, 2014

A Report by the Drinking Water Inspectorate for Northern Ireland

Northern Ireland Environment Agency

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Foreword

We are pleased to present our 19th annual report on the quality of drinking water in Northern Ireland. This report provides the Drinking Water Inspectorate's assessment of how the regulatory requirements have been met during 2014.

The provision of a safe, clean drinking water supply is an essential service that contributes to the health and well being of the community. Over 99% of the population in Northern Ireland receives its drinking water from NI Water, while the remainder of the population is served by private water supplies.

Overall compliance of the public water supply in 2014 with the standards set by the European Union Drinking Water Directive, and as required by our National legislation, is reported as 99.86%. This provides assurance as to the overall quality of our drinking water, as NI Water continues to improve compliance with its statutory duty (from 99.81% in 2013). The Directive sets mandatory minimum standards which are required to be complied with, and this means that NI Water is required to take action to address the 0.14% where compliance was not achieved. The corrective actions needed would be varied, with some actions completed shortly after the occurrence, while other situations required more substantive remedial measures. Some of these measures may require funding and delivery through NI Water's business plans.

To enable us to uphold consumer confidence in the quality of their water supplies, we look at other information sources to assess how well NI Water carries out its responsibilities to supply safe, clean drinking water. This includes the reporting of water quality events, and the number of consumer contacts made from those who have experienced problems with their drinking water quality.

Once again, we highlight the number of events that are reported, particularly those due to operational issues relating to the ineffective performance of water treatment works. We report on a major event at the end of 2014 due to Industrial Action at NI Water which led to interruptions to consumers' water supplies and related water quality issues in many parts of Northern Ireland, particularly in western areas. We also note that the majority of consumer complaints received by NI Water throughout 2014 related to the appearance of their drinking water, particularly when it was discoloured. It is important for NI Water, when addressing water quality issues related to events and consumer concerns, that it adopts solutions which are customer focussed.

The report highlights the ongoing actions required to improve lead compliance. This is a complex area with lead compliance being influenced by many factors, including those under the control of NI Water, as well as the consumer. We welcome the development and implementation of NI Water's strategies in tackling lead non-compliance, including pro-active lead replacement, along with its continuing work with other key stakeholders.

During 2014, NI Water had to produce and agree its business plan and funding from 2015-21 with the Utility Regulator, through the price control process (PC15). We have worked alongside the other key stakeholders in this process to ensure drinking water quality remains an important driver in NI Water's future investment priorities. As we move forward we will continue to contribute to the ongoing implementation of the investment programme within PC15 to ensure that drinking water quality and the provision of safe, clean drinking water remains a priority for NI Water.

Our report also provides information on our regulatory responsibilities regarding private water supplies. These supplies are used for a range of purposes (from domestic dwellings to those supplying large commercial and public premises). The quality of some of these supplies is highly variable. During this reporting year, 134 supplies were routinely monitored under the regulations. The overall compliance with the regulatory standards in 2014 is reported as 98.90%, a decrease from 99.05% in 2013. As in previous years, this compliance level is notably lower than that for public supplies. In undertaking our duties in relation to private supplies, we will continue to work with owners and users to maintain and improve on the quality of their water supplies.

We hope you find that this report is both an interesting and useful reference source of drinking water quality in Northern Ireland.

Drinking Water Inspectorate
July 2015

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Executive Summary

This is the 19th report in a series published by the Drinking Water Inspectorate, acting in our regulatory role in matters relating to drinking water quality. We act on behalf of the Department for Regional Development (DRD) in respect of public water supplies, and on behalf of the Department of the Environment (DoE) in relation to private water supplies.

Our report gives an independent commentary on our assessment of, and our checks on, the quality of drinking water provided by Northern Ireland Water Ltd (NI Water). It also presents details of the quality of private water supplies for which we undertake a regulatory monitoring programme.

Public Water Supplies

Comprehensive monitoring is undertaken by NI Water to assess public drinking water quality, and compliance is based on the results of key tests carried out throughout the water supply chain: from water treatment works; service reservoirs; and consumers' taps.

Overall public drinking water quality remains high with 99.86% compliance reported in 2014.

High levels of compliance were achieved at consumers' taps for many parameters, but of the 38 mandatory parameters tested, 12 did not achieve full compliance. Those parameters failing to meet full compliance were; lead; iron; trihalomethanes (THMs); odour; coliform bacteria; taste; *Clostridium perfringens*; aluminium; manganese; turbidity; the individual pesticides, MCPA and Clopyralid; and *E. coli*.

The parameter with the lowest reported compliance in 2014 was lead at 97.45% (98.99% in 2013). The regulatory standard for lead became 10µg/l from 25 December 2013, following a ten year period where an interim standard of 25µg/l had applied. This decrease in compliance for 2014 should be taken in this context. The water leaving treatment works and in the distribution system contains only trace amounts of lead. However, where lead has been used for service pipes between the water main and the kitchen tap or in domestic plumbing, there is a risk of concentrations at the consumers' tap exceeding the lead standard. A significant amount of work is required to improve compliance with the lead standard in the future and we welcome, and continue to work with NI Water in the implementation of its lead strategy.

Compliance with microbiological standards is important as contraventions may indicate a breach in the integrity of the water supply system or a failure in the treatment process. The results reported in 2014, confirm the general safety of drinking water supplies is good, with overall microbiological quality at 99.90%. The specific testing for microbiological quality at consumers' taps has improved from last year with 99.73% reported for 2014, compared to 99.55% in 2013.

Overall compliance was assessed against EU and national standards, and for 2014 there were 147 (0.14%) tests failing to meet them. This is an improvement on the figure reported for 2013 of 193 (0.19%) tests not achieving compliance. Compared to 2013 there has been an increase in the number of tests achieving compliance at consumers' taps; notably: iron; THMs; coliform bacteria and *E. coli*.

Following investigation by NI Water to identify the cause of contraventions, the necessary corrective action is then required to be put in place to prevent recurrence. The scale of this work varies and it may be that planned investment in the water infrastructure is necessary; or that changes to operational practices are required.

Where necessary, particularly for persistent contraventions of the regulations, we take enforcement action to ensure delivery of the required corrective action within specified timescales. In 2014, there were four enforcements put in place following regulatory contraventions. For two of these enforcements, measures were required to address issues of non-compliance with regulatory standards for: hydrogen ion (pH) contraventions within the Dungonnell Ahoghill Water Supply Zone; and manganese contraventions in Camlough Newry West Water Supply Zone. The other two enforcements were issued to ensure appropriate controls were put in place to provide effective disinfection at Drumaroad and Rathlin Water Treatment Works.

Although there were high levels of compliance for 2014, events that have the potential to affect water quality did occur, and these are required to be

reported to the Inspectorate. Of the 64 events reported in 2014, one was categorised as 'Major'; one as 'Serious'; 34 as 'Significant'; 19 as 'Minor'; and 9 as 'Not Significant'. Of the 64 events, 50 occurred at water treatment works and were primarily related to a lack of effective treatment, or operational activities at the works.

The major event was the impact of the NI Water Industrial Action which took place from the 22 December 2014 until 22 January 2015. The Industrial Action had an adverse affect on the continuity of water supply in many areas, particularly in the west of Northern Ireland and there were also related water quality issues. The serious event was caused by a burst main at McVeigh's Well in Newtownabbey, with over 100 related consumer contacts in the first four hours of the event. As a consequence of this major burst, areas of North Belfast were without a mains water supply for approximately 24 hours from the afternoon of the 21 May 2014, and there were also associated water quality issues. As part of the event assessment process, it is essential that NI Water continues to put learning and appropriate mitigation measures in place through its drinking water safety plan approach. Vigilance is required and good operational practice and management should be applied at every stage in the water supply process.

To enable us to evaluate consumers' confidence in the quality of drinking water at their taps, we receive information from NI Water on the complaints and concerns expressed by consumers. The overall number of these reported in 2014 was 6,331 and compared to the 7,087 reported in 2013, this is a decrease of 10.7%. The 2014 figure is more in line with the number of consumer contacts recorded prior to 2013. As with previous years, the highest percentage of consumer contacts relate to the appearance of their drinking water (68.8% in 2014; 69.1% in 2013) which are mainly attributed to the presence of suspended iron particles. This highlights that the samples taken for regulatory compliance purposes (which have indicated an improving compliance for iron in 2014) are insufficient on their own, to reflect what individual consumers experience at their taps.

As NI Water moves into a new six year investment programme from 2015 to 2021 (PC15), it has adopted a more customer focussed approach, in particular in setting work programmes related to mains rehabilitation. It is hoped that the ongoing prioritization of work, through this process, will benefit the consumer and address the level of complaints, particularly those related to discoloured water.

Private Water Supplies

Although the number of people directly served by a private water supply may be small, many more people are exposed to them through their use in both commercial and public activities. In Northern Ireland, private water supplies are often used as an alternative to, or in conjunction with, the public supply for a range of activities such as: holiday accommodation (hotels, bed and breakfast facilities); public buildings (hospitals, care homes, and universities); or food processors (manufacturers of food and drink products).

The same drinking water quality standards apply for private water supplies as for the public water supply. During 2014, our private water supply sampling programme monitored 134 sites. The overall compliance has dropped to 98.90% in 2014, from 99.05% in 2013, with full compliance not being achieved for 19 parameters: coliform bacteria; hydrogen ion; iron; manganese; Enterococci; *E. coli*; ammonium; turbidity; *Clostridium perfringens*; trihalomethanes; total pesticides; aluminium; individual pesticides (Glyphosate, and Mecoprop); sodium; sulphate; bromate; chloride; and lead.

Full compliance was achieved for 84 out of 134 (63%) of our sampling sites. Of the 50 sites which did not comply with the regulatory standards: 30 used their private supply as the primary source of drinking water; 12 supplies were used for washing equipment and surfaces in contact with food or drink; seven used the supply as an ingredient in food and drink; and one was solely for personal hygiene (showers, wash hand basins).

All private water supply contraventions are investigated and action taken dependent on the severity of the failure. This can include restrictions on the use of the supplies. The implementation of corrective actions may require improved source protection measures; or installation of, or improvements to, treatment systems.

We will continue our work with supply owners and the local councils, with the aim of reducing the contamination risks at these sites and improving their overall water quality. Owners and users of private water supply sites have a responsibility to provide a safe supply of water that complies with the regulatory standards. We continue to assist them in this role by providing technical advice and guidance on the steps necessary to achieve this.

Risk Assessments

As part of managing the risk of contamination through the water supply chain, water providers, whether from public or private supplies, are required to undertake an appropriate risk assessment. These assessments should characterise the risks to the drinking water supply and detail the controls measures required to mitigate these. It is important that NI Water ensures that its risk assessments are kept under review and are 'live' documents which reflect both current and potential future risks to the water supply.

At the start of the water supply chain, the use of pesticides within the catchment during 2014 has lead to a challenge to the treatment processes at certain water treatment works. For public water supplies there was an increase in the number of sites where pesticide contraventions occurred, with eight reported in 2014; compared to five in 2013. NI Water continues to carry out work within these catchments to reduce pesticide levels through dedicated programmes of work, both at an operational level, and through ongoing engagement, and education of the key stakeholders. In line with the risk assessment approach, NI Water is also reviewing the effectiveness of the current treatment at these works at reducing the level of pesticides below the regulatory limit, and in some cases this may require further treatment options to be considered.

For other parts of the supply chain NI Water continues to refine the information it uses to assess risks, in particular in relation to distribution systems. We welcome the work by NI Water in developing a lead strategy which includes within its PC15 business plan a prioritized replacement of its lead pipes through targeting lead hotspots. There is also a regulatory duty on NI Water to keep disinfection by-products, such as trihalomethanes (THMs), as low as possible within the distribution system. We assess NI Water's ability to control the levels of THMs within its networks by comparing average THM values. Further work is required by NI Water to reduce the number of water supply zones not meeting an overall THM average value of 50µg/l, with 60% of zones reporting an annual average above 50µg/l in 2014, compared to 44% in 2013.

In relation to private water supplies we continue to work with local councils, along with the cooperation of the owners and users, to complete risk assessments of these water supplies. The development of action plans using a new risk assessment tool should assist in driving the required improvements to remove contamination risks identified at individual private supplies.

Looking Forward

There are ongoing challenges to ensure the continuing provision of safe, clean, sustainable drinking water supplies into 2015 and beyond. These include managing the pressures that can arise in the water supply chain from the risk of contamination, and this will remain central to our role in regulating drinking water quality. During 2014 we have worked alongside NI Water, the Utility Regulator, the Department for Regional Development, and the Consumer Council for Northern Ireland, in identifying funding priorities for drinking water quality within the PC15 investment programme. We acknowledge the financial constraints within the PC15 process and the requirement to re-prioritize work programmes to reflect the level of funding. As we move forward we will continue to input into the ongoing implementation of the PC15 programme to ensure that the provision of safe, clean drinking water remains a key priority for NI Water.

We will continue to work with NI Water in their ongoing management of our drinking water supplies, and provide advice and guidance to ensure risks are identified and controlled effectively. We will actively engage with all stakeholders in the delivery of the goals set within the Department of Regional Development's Long Term Water Strategy. In improving the safety of private water supplies we will work to educate the owners and users of the potential risks of using such supplies.

We will continue our advocacy for improving the quality of our abstraction sources through working with the Northern Ireland Environment Agency and NI Water, in the development of the 2nd cycle of the River Basin Management Plans (RBMPs), and to enhance the protection of sources used for abstraction through the identification of drinking water protected areas and safeguard zones. Protecting the water in the catchments from which water is abstracted not only improves the untreated water quality and reduces potential contamination risks, but it can also mitigate against the need for additional treatment and purification processes.

Section 1
Public Water Supplies

Image: *NIEA*

Part 1
Drinking Water Quality

- Overall drinking water quality remains high at 99.86%
- 12 parameters did not achieve full compliance with the regulatory standards
- 64 events reported: 78% occurred at water treatment works
- Enforcement action taken on four occasions in response to regulatory contraventions

NI Water is a government-owned company with responsibility for supplying and distributing public drinking water throughout Northern Ireland. Figure 1.2 provides some details about the company.

Drinking Water Quality Testing

Throughout 2014, NI Water sampled drinking water across Northern Ireland to test for compliance with the standards in The Water Supply (Water Quality) Regulations (Northern Ireland) 2007 (as amended). The Regulations require sampling programmes to be in place to ensure that water quality is monitored at: water treatment works (WTWs); service reservoirs (SRs); water supply points; and consumers' taps in water supply zones (WSZs).

In 2014, 102,036 tests were carried out for a range of different parameters. A description of each and its regulatory limit (or prescribed concentration or value [PCV]) is available on our website (refer to Annex 9).

Overall Drinking Water Quality

Compliance with the standards is important as contraventions may indicate a failure in the treatment process or a breach in the integrity of the water supply system. The overall results confirm that the general safety of drinking water supplies remains good.

Overall drinking water quality in 2014, for the key parameters monitored at water treatment works, service reservoirs and consumers' taps remains high (99.86%). Of the 102,036 tests we used to assess overall compliance, 147 (0.14%) failed to meet the standards (193; 0.19% in 2013), (Table 1.1 refers).

Compared to 2013 there has been an increase in the overall number of tests achieving full compliance in 2014 (Figure 1.1 refers). This is attributed to improved microbiological performance at water treatment works, service reservoirs and consumers' taps.

Figure 1.1: Overall Drinking Water Quality, 2010 - 2014

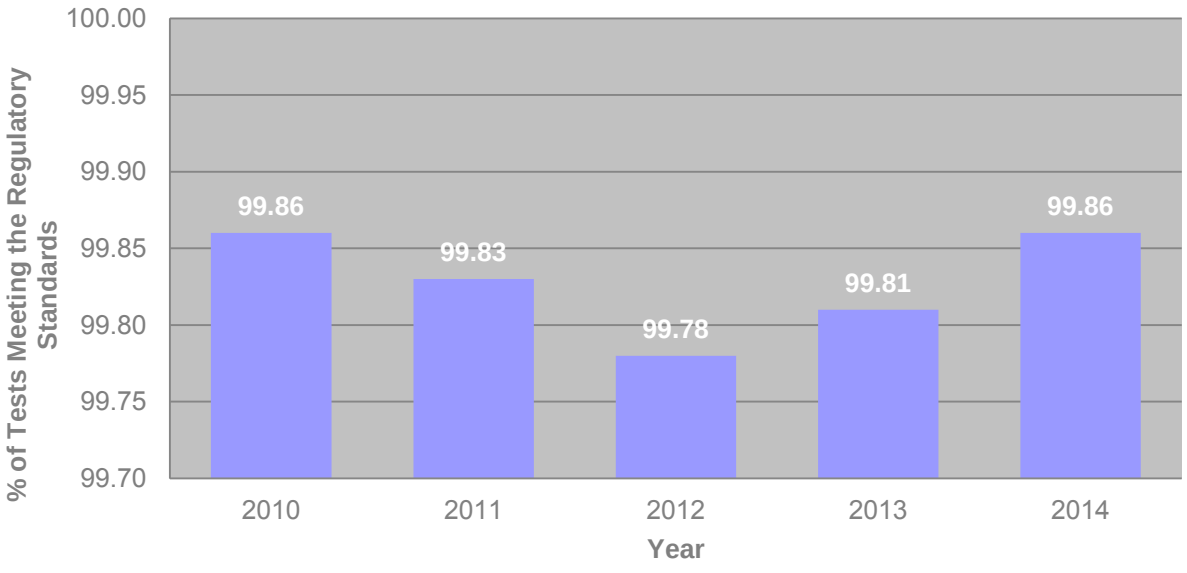


Figure 1.2: NI Water Supply Details, 2014

Sources

- 34 sources used
- 45.8% impounding reservoirs
- 54.1% rivers and loughs
- 0.1% boreholes

Treatment

- 25 water treatment works
- 2 < 3,000 m^3 /d
- 11 ≥ 3,000, ≤ 12,000 m^3 /d
- 12 > 12,000 m^3 /d
- 563 Ml/day supplied

Distribution Systems

- 302 service reservoirs
- 183 < 2,000 m^3 capacity
- 91 ≥ 2,000, ≤ 10,000 m^3
- 28 >10,000 m^3
- 26,710km of mains pipe

Consumers' Taps

- Population of Northern Ireland is 1.8 million
- 825,000 properties connected
- 99.8% of population
- 50 water supply zones

Table 1.1: Overall Drinking Water Quality in 2014

	No. of Tests	No. of Tests not Meeting the Standards
Water Leaving Water Treatment Works (WTWs)		
E. coli	6,460	0
Coliform Bacteria	6,460	2
Microbiological Total	**12,920**	**2**
Nitrite	225	0
Turbidity	6,460	11
Chemical Total	**6,685**	**11**
Total (Microbiological and Chemical)	**19,605**	**13 (0.07%)**
Water in Service Reservoirs (SRs)		
E. coli	15,640	4
Coliform Bacteria	15,640	17
Total	**31,280**	**21 (0.07%)**
Water at Consumers' Taps or Supply Points (WSZs)		
E. coli	5,220	1
Coliform Bacteria	5,220	28
Enterococci	392	0
Clostridium perfringens	2,261	6
Microbiological Total	**13,093**	**35**
Zone Chemical Analysis	26,467	68
Supply Point Chemical Analysis*	11,591	10
Chemical Total	**38,058**	**78**
Total (Microbiological and Chemical)	**51,151**	**113 (0.22%)**
Overall Water Quality		
Overall Microbiological Quality	**57,293**	**58 (0.10%)**
Overall Chemical Quality	**44,743**	**89 (0.20%)**
Overall Drinking Water Quality	**102,036**	**147 (0.14%)**

**Collected at WTWs as no significant change occurs during distribution.*

Water Quality at Consumers' Taps

Twelve parameters did not achieve full compliance at consumers' taps in 2014: lead, iron, trihalomethanes (THMs), odour, coliform bacteria, taste, *Clostridium perfringens*, aluminium, manganese, turbidity, pesticides - other substances (MCPA & Clopyralid) and *E. coli*. A summary is provided in Table 1.2.

The parameter with the lowest reported compliance in 2014 was lead at 97.45% (98.99% in 2013). The regulatory standard for lead became 10µg/l from 25 December 2013, following a ten year period where an interim standard of 25µg/l had applied. This decrease in compliance for 2014 should be taken in context with the change in the lead standard from 25 to 10µg/l. The water leaving treatment works and in the distribution systems contains only trace amounts of lead. However, where lead has been used for service pipes between the water main and the kitchen tap or in domestic plumbing, there is a risk of concentrations at the consumers' tap exceeding the lead standard.

All major water supplies in Northern Ireland are modified through the addition of orthophosphoric acid in the treatment process. This process enables a protective coating to be formed over lead pipes, to minimise levels of lead in the water supply. When a failure occurs, NI Water is required under the Regulations to inform the occupier in writing when a lead sample taken at a property exceeds the regulatory limit. NI Water is also required to modify or replace the section of lead pipe to the boundary of the property but it is the responsibility of the property owner to replace any lead pipe within the property.

More information on lead, and on the other eleven parameters listed above, is provided in Part 5 of this report.

Water Quality Related to Domestic Distribution Systems

Domestic Dwellings

NI Water is required to investigate all contraventions of the drinking water quality standards, including those due to the internal distribution system within buildings.

Where these failures are within domestic dwellings, NI Water must inform the owner with the details of the failure and provide appropriate advice in relation to what actions the owner may take to rectify the contravention and, to protect public health.

Following notification to the owner, NI Water is not required to take any further action where the contravention has been caused by the owner's internal plumbing and distribution systems within the boundary of the premises, unless the failure is related to a breach of The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009. Where a failure is related to such a breach then NI Water must take appropriate action.

There were 25 contraventions reported to us in 2014 which NI Water determined to be due to the internal plumbing within domestic properties and these were related to the following parameters: 14 coliform bacteria; seven lead (2 of which also had lead on NI Water side); one *E. coli;* one taste and one odour (oil contamination); and one iron related to a private main within a housing development.

Table 1.2: Parameters Not Meeting Full Compliance at Consumers' Taps in 2014

Parameter	No. of Samples Taken in 2014	No. of Tests not Meeting the Standards in 2014	% Compliance in 2014	% Compliance in 2013
Lead	392	10	97.45	98.99
Iron	1,896	20	98.95	98.08
Total trihalomethanes	391	4	98.98	98.48
Odour	1,896	14	99.26	99.67
Coliform bacteria	5,220	28	99.46	99.04
Taste	1,896	10	99.47	99.94
Clostridium perfringens	2,261	6	99.73	99.91
Aluminium	1,896	4	99.79	99.52
Manganese	1,896	3	99.84	99.73
Turbidity	1,896	3	99.84	99.79
Pesticides - other substances*	7,888	10	99.87	99.97
E. coli	5,220	1	99.98	99.87
All other analysed parameters	**18,403**	**0**	**100**	**100**
% Compliance at Consumers' taps	**51,151**	**113**	**99.78**	**99.74**

**All pesticides other than aldrin, dieldrin, heptachlor and heptachlor epoxide.*

The Domestic Distribution System Regulations

At premises where water is made available to members of the public (such as schools, hospitals or restaurants) NI Water is required to fully investigate the cause of any failure to comply with water quality standards. This investigation should include an assessment of whether the failure is attributed to a breach of the Water Fittings Regulations. If the failure is not attributable to either the water supplied from NI Water, or the Water Fittings Regulations, then we are required to follow-up such failures with the owners under The Water Supply (Domestic Distribution Systems) Regulations (Northern Ireland) 2010. If we assess the failure as likely to recur, or if it constitutes a potential danger to human health, we may serve a notice in writing to the owner of the premises. A notice would require the owner to undertake the necessary actions to protect public health and bring the supply back into compliance.

In 2014, we received investigation reports from NI Water for two public premises where they indicated that the contraventions were due to the internal domestic distribution system. We issued a notification to each of these premises, requiring them to put in place the appropriate measures to deal with these contraventions and provide a timescale for this work.

One of these contraventions was for iron, and was originally thought to be related to the domestic distribution system. Following a re-investigation by NI Water, it was found to be due to the condition of the water mains within the control of NI Water, and no action was required to be taken by the premises.

The other contravention was for the lead and remedial work was undertaken. This resulted in all internal lead pipes being replaced within the premises. On completion of the work, further sampling indicated that all results were satisfactory and no further action was required. We acknowledge the ongoing assistance and co-operation afforded to us by NI Water, local council staff, and the premises owners in investigating these contraventions and taking the necessary action to ensure future compliance.

Events affecting Drinking Water Quality

We require NI Water to inform us of all events that have affected, or are likely to affect, drinking water quality or sufficiency of supplies, and, where as a result, there may be a risk to consumers' health. This information must be provided according to agreed guidance and reporting procedures. We also encourage NI Water to notify us of events that may fall outside the criteria, but which could, nonetheless, impact on water quality or cause concern to consumers. There is always the potential for events to happen. What matters is how well NI Water minimizes both the risks of occurrence and the consequences of events as it acts to protect public health at all times.

We assess all the information available to determine:

- what caused the problem and whether or not it was avoidable;
- what NI Water did in response and how it handled the situation;
- what lessons can be learned to prevent similar incidents in the future; and
- if there were any contraventions of the Regulations.

The five categories of events in order of increasing severity are: Not Significant, Minor, Significant, Serious and Major.

In 2014, 64 events were reported to us: 78% of which occurred at 23 out of the 25 WTWs and these were mostly related to lack of effective treatment or difficulties with the treatment process. While the total number of events has limited use as a meaningful indicator, what is important is the significance of each event. Of the 64 events reported, one was categorized as Major, one as Serious; 34 as Significant; 19 as Minor; and 9 as Not Significant (Annex 4 provides more details). A summary of the 2013 and 2014 event categorizations is provided in Table 1.3.

Table 1.3: Comparison of Water Quality Events 2013 and 2014

Year	DWI Risk Assessment Category					Total
	Not significant	Minor	Significant	Serious	Major	
2014	9 (14.1%)	19 (29.7%)	34 (53.1%)	1 (1.6%)	1 (1.6%)	64
2013	14 (24.6%)	17 (29.8%)	24 (42.1%)	2 (3.5%)	-	57

The **Major** event was the impact on the drinking water supply of the NI Water Industrial Action which took place from the 22 December 2014 until 22 January 2015.

The Industrial Action had an adverse affect on the continuity of water supply in a number of areas, particularly in the west of Northern Ireland, and there were related water quality issues. There were two Significant water quality events associated with the Major event in December 2014 (Annex 4 provides details). Three further events occurred in January 2015 and these will be covered in our 2015 annual report.

The **Serious** event was caused by a burst main at McVeigh's Well in Newtownabbey. Parts of North Belfast were without a mains water supply for approximately 24 hours from the afternoon of the 21 May 2014. There were over 100 related consumer contacts in the first four hours of the event. The event was mainly related to the interruption to the water supply but there were associated water quality issues as well.

The 34 **Significant** events were as follows:

- 29 (85%) occurred at water treatment works and were caused by a variety of issues including: difficulties with the performance of the coagulation processes; lack of adequate treatment (including pesticide removal treatment); management of operational work; loss of disinfection; and difficulties caused by the Industrial Action. These led to aluminium, hydrogen ion (pH); iron, pesticide (Clopyralid and MCPA), taste and odour, THM and turbidity contraventions (see Part 3 for more details);
- four (12%) were caused by various issues in the distribution system (Details are provided in Annex 4); and
- one was related to a consumer concern regarding a chlorine taste and odour.

We recognize the operational nature of water treatment and supply, and that events will occur which require immediate corrective action to be taken by NI Water. What is important is that lessons are learnt and any necessary remedial action is undertaken by NI Water. This should be reflected in its risk assessments as part of its drinking water safety plan approach to prevent recurrence of drinking water quality events.

Overview of Consumer Contacts

Every year NI Water provides us with consumer contact information to help us understand consumers' concerns (Table 1.4 refers). The total number of consumer contacts reported in 2014 was 6,331 compared to 7,087 in 2013. The figure reported for 2014 is more in line with the number of consumer contacts prior to 2013.

As with previous years, the highest percentage of contacts and concerns continues to relate to the appearance of drinking water, with 68.8% in 2014. This is in contrast with the improving iron compliance reported earlier in this section and demonstrates that the consumer experience does not necessarily follow trends in regulatory compliance.

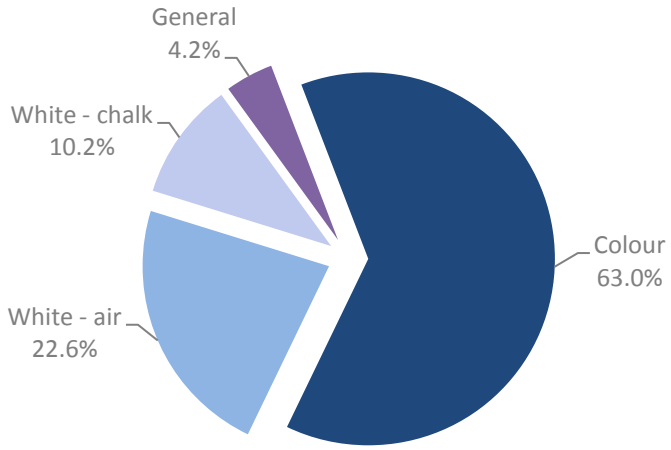
Looking more closely at the number of consumer contacts made relating to the appearance of drinking water, Figure 1.3 illustrates the high percentage of contacts relating to colour. Discoloured water can arise when the water appears orange or brown due to suspended particles of iron, or black due to suspended particles of manganese. Iron and manganese may be present due to inadequate treatment or from corrosion of cast-iron distribution mains.

Ongoing and planned long-term mains rehabilitation programmes need to target these consumer concerns. More detail on consumer concerns is provided in Part 5.

Table 1.4: Consumer Contacts Relating to Appearance, 2012 - 2014

	Overall Number of Contacts	% of all Contacts Relating to Appearance	% of Appearance Category Relating to Colour
2014	**6,331**	**68.8**	**63.0**
2013	7,087	69.1	70.7
2012	6,188	63.6	62.6

Figure 1.3: Percentage of Consumer Contacts in the Appearance Category, 2014



The Technical Audit Process

The technical audit process is the term used to describe how we check NI Water's compliance with its statutory obligations. The audit process also allows us to observe whether good practice is being followed. We operate a risk-based approach to technical audit which takes into consideration factors such as water quality monitoring, events and previous audits. This enables us to prioritize and focus the technical audit work to have the most benefit. Any corrective action that follows on from our recommendations and suggestions following the audit process is monitored to ensure satisfactory completion. A summary of the 2014 Technical Audit Programme is detailed in Annex 5.

Regulatory Processes

Risk Management

In fulfilling its regulatory requirements, NI Water must carry out a risk assessment, which is part of the drinking water safety plan (DWSP) approach adopted at every treatment works, associated catchment and supply system. This process is required to be kept under regular review in relation to NI Water's ongoing assessment of risk; for example, NI Water is required to review the level of risk following an investigation into a water quality event.

These assessments identify and quantify the inherent risks throughout individual water supply systems and detail mitigation measures, and the adoption of effective controls to protect drinking water quality.

These control measures may involve actions relating to: minimizing the potential for contamination of source waters; reducing or removing contaminants through appropriate treatment processes; and measures preventing contamination within the distribution network and domestic water systems within buildings.

NI Water's quantification of the risks within every aspect of the production and supply of drinking water must be sufficiently informed and utilized by the company. This is fundamental to ensuring that NI Water identifies its current and future investment planning needs to secure high quality drinking water through the Price Control (PC) programmes of work.

The individual sections that follow in this report provide more detail on how the risk assessment process is undertaken in the specific parts of the water supply chain. This covers from catchment through to treatment, and onward within the distribution system to the consumers' tap.

Enforcement Orders

Where NI Water has failed to comply with its regulatory duties, there are a range of statutory processes to ensure that compliance is achieved.

Details of our Enforcement and Prosecution Policy are available on the NIEA website. The enforcement process may be initiated with the issue of a 'Consideration of Provisional Enforcement Order' (CPEO), whereby, NI Water is requested to submit an Undertaking to demonstrate what steps it has taken, or is going to

take, to ensure compliance with the requirements of the Regulations.

If NI Water fails to comply with the requirements of an Undertaking within a CPEO or, we determine that NI Water should undertake or comply with a remedial measure, then the next stage of enforcement would be to issue a Provisional Enforcement Order (PEO). A PEO would require NI Water to undertake certain remedial measures or actions; failure to comply with a PEO would result in a further escalation of enforcement, with the issuing of an Enforcement Order.

In ensuring compliance with the regulations we may also issue Notices which would require NI Water to undertake the specified actions. A Regulation 28 Notice may be issued where we determine that a risk assessment has identified a significant risk of supplying water which would constitute a potential danger to human health.

During 2014, we issued two CPEOs, one PEO and one Regulatory Notice:

- **CPEO/14/01** - to ensure remedial measures were put in place to deal with Hydrogen ion (pH) contraventions within the distribution system around Straid Road, New Road, and Ballymontenagh Road, Ahoghill;
- **CPEO/14/02** - to ensure remedial measures were put in place to deal with manganese contraventions at Camlough WTWs and its associated water supply area;
- **PEO/14/01** - to require remedial measures to be put in place to prevent the potential for a recurrence of a failure to disinfect the water leaving Drumaroad WTWs; and
- **Regulation 28 Notice** - requiring NI Water to implement a series of remedial measures related to ensuring appropriate controls were in place in the operation of the disinfection process at Rathlin WTWs.

Undertakings relating to two CPEOs issued in 2013 were completed during 2014:

- **CPEO/13/03** relating to MCPA (pesticide) contraventions at Clay Lake WTWs; and
- **CPEO/13/04** relating to microbiological contraventions at Dunore WTWs.

Full details on these enforcements actions and details of the remedial measures undertaken by NI Water are contained within Annex 6 of this report.

Investment Planning

Price Control Process

The Price Control (PC) process is a mechanism by which NI Water secures its funding and investment priorities for the coming years. We continued to actively engage with NI Water; the Utility Regulator; the Department for Regional Development; the Consumer Council; and the Northern Ireland Environment Agency as part of the investment planning process to identify funding priorities in the current and future PC processes.

The funding priorities for drinking water quality for NI Water during the period of our report form part of the PC10 process. This initially covered the period 2010-2013 but has subsequently been extended until 2015.

During 2014 we have been involved along with other stakeholders in agreeing the drinking water quality priorities within the next price control process PC15, which covers the six year period 2015-2021. We recognize the competing priorities which exist within this process, along with the funding constraints which are in place. As the drinking water quality regulator, our primary objective is to identify programmes of work that are necessary to secure compliance with drinking water standards. This work assists in identifying and targeting infrastructure and operational improvements required by NI Water to maintain and enhance its operations in delivering safe, clean water supplies.

Part 2
Catchment

Image: *Dungonnell Impoundment reservoir - NIEA*

Part 2
Catchment

- Eight supplies had pesticide levels above the regulatory limit in 2014
- Elevated manganese in raw water sources caused treatment issues in one supply compared to two in 2013
- NI Water has continued to engage with key stakeholders in promoting best practice in the management of its catchments

This section of the report looks at the catchment: the start of the 'water supply chain' from which NI Water abstracts water before it is treated and distributed onwards to consumers' taps. We look at how catchments are managed as part of the drinking water safety plan approach to provide safe, clean drinking water.

In Northern Ireland, public water supplies are obtained from surface water sources, with the exception of the water supply to Rathlin Island, which is supplied from a borehole. The nature and structure of the landscape, together with a well distributed rainfall pattern, have meant upland and lowland reservoirs and direct river abstractions are the primary water sources used in Northern Ireland.

Surface water sources contain naturally occurring organic materials as well as other potential contaminants which need to be removed by suitable water treatment processes. It is these risks and associated control measures (treatment) which are identified within NI Water's catchment management plans, and its drinking water safety plans.

Water quality can vary between sources due to factors such as: the nature and structure of the rock types; soil; vegetation; and land use. These are important factors that may have an impact on the properties of a drinking water supply, such as taste, hardness, acidity (pH), organic and mineral content. These factors will also determine the level of treatment required within the water treatment works (WTWs).

Water Abstraction

In Northern Ireland the abstraction of raw water from rivers, reservoirs, and loughs is controlled by the Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006 which require major water abstractors to obtain a licence from the Northern Ireland Environment Agency (NIEA).

NI Water is authorised to abstract up to 1,075 Ml/d under license from NIEA and, in 2014, water was abstracted from 34 sources across Northern Ireland.

NI Water is required to have in place a strategic plan to ensure that they have appropriate resources to maintain drinking water supplies for predicted usage up to the year 2035. This is detailed in the Water Resource Management Plan (WRMP) and takes account of population changes, housing and water usage, as well as predicted changes to our climate.

Catchment Risk Assessment

As part of managing the risk of contamination through the water supply chain from 'source to tap', NI Water is required to ensure that it has assessed all potential risks within the catchments and keep its risk assessments under review. These assessments must then detail the arrangements NI Water is putting in place to mitigate these risks to protect the catchment and preserve the quality of its source waters.

In the management of the risks within catchments, NI Water has a regulatory duty to undertake a monitoring programme to determine the raw water quality throughout the year. The frequency and range of parameters to be tested should be in line with the level of risk as identified within its risk assessment for each individual catchment.

NI Water must scope for potential contaminants being present in its catchments, including those listed under EU priority substances, and incorporate within its risk assessments. Where it has identified these could be present, it is required to monitor for these substances at a set frequency within the Regulations, based on the population served by the water treatment works.

Monitoring is also important for the day to day operational management of water treatment works,

as changes in the raw water quality can require adjustments to be made to the treatment process to provide for the effective removal of contaminants. This is particularly important in relation to establishing baseline information, for example in monitoring for seasonal changes in pesticide levels in surface water sources, to ensure appropriate levels of treatment are in place at all times.

In managing drinking water catchments NI Water must liaise closely with a number of stakeholders, including the environmental regulator NIEA, the Department of Agriculture and Rural Development (DARD), and Forestry Service. This liaison is important in ensuring appropriate lines of communication are in place for exchanging information on risks and associated control measures within catchments.

Figure 2.1 Raw Water Abstraction Point

Source: NI Water

Potential Contaminants in NI Water's Catchments

Both natural and human factors have the potential to influence the raw water quality in catchments:

- **Natural factors** - include wildlife, climate, topography, geology, vegetation; and
- **Human factors** - include point sources (e.g. waste water treatment works discharges) and non-point sources (e.g. surface run-off from agricultural activities such as pesticide usage).

There is the potential for harmful bacteria to be present within drinking water sources, so it is important that adequate treatment is in place to prepare water for effective disinfection to make it safe to drink. In some catchments the presence of certain algae may have the potential to cause taste and odour issues, and in such cases specific treatment would be required at the water treatment works to ensure the water is acceptable to consumers.

NI Water must also consider other factors, for example increased run-off from the surrounding catchment from heavy rainfall or snow melt, or from temperature rises in the water body which can affect the characteristics of the water. In dealing with such issues, NI Water is required to have robust monitoring and controls in place to enable treatment processes to be adapted quickly to deal effectively with changes in raw water quality. This ability to adapt to changing water quality within the catchment is important in providing the first control measure in the provision of safe, clean drinking water.

As the potential list of contaminants within catchments is diverse, NI Water must risk assess each individual catchment to determine the individual risks and ensure appropriate mitigation is in place. The two main contaminants which were identified as being an issue in drinking water sources during 2014 were the pesticide MCPA, and manganese.

Pesticides

Pesticides are a group of substances that include insecticides, herbicides, fungicides and algicides that are commonly used as part of land management practices in catchments. The Regulations set standards and sampling frequencies for individual pesticides as well as a standard for the sum of all pesticides, 'the total pesticide' standard, within water supply zones. NI Water is also required to undertake a monitoring programme for pesticides within the catchment, with the range and frequency of sampling being informed by the level of risk as identified within its risk assessments. Water sources may contain traces of pesticide residues as a result of agricultural use (e.g. pest control on crops) and non-agricultural use (e.g. herbicide for weed control on roads).

During 2014, MCPA & Clopyralid were detected above the regulatory limit. MCPA is a herbicide widely used in Northern Ireland for controlling broadleaved weeds in grass and cereal crops, as well as being used in the clearing of rushes. Clopyralid is a herbicide used to control annual and perennial broadleaved weeds, particularly thistles and clover.

Compliance Sampling Programme for Pesticides

During 2014, 38 individual pesticides were monitored for under the regulatory compliance programme at authorised supply points. This resulted in a total of 8,816 pesticide determinations, with 232 samples being taken for each individual pesticide under this sampling programme. From the 232 regulatory samples taken for MCPA, five samples breached the standard of 0.1µg/l: of these, two occurred at Camlough WTWs; one at Dorisland WTWs; and two at Killyhevlin WTWs. From the 232 regulatory samples taken for Clopyralid, five samples breached the standard of 0.1µg/l: these occurred at Clay Lake WTWs; Dorisland WTWs; Dungonnell WTWs; Killyhevlin WTWs; and Lough Fea WTWs.

Operational Sampling Programme for Pesticides

In addition to the regulatory compliance sampling programme for pesticides, NI Water also undertakes an operational monitoring programme for investigative purposes and also to inform its risk assessments to ensure that appropriate treatment and catchment control measures are put in place.

This operational monitoring programme for 2014 also identified pesticide detections above the regulatory limit in the water going into supply from Belleek WTWs, Camlough WTWs, Derg WTWs and Killyhevlin WTWs.

All water treatment works with pesticide detections, both regulatory and operational from 2011 to 2014 are summarized within Table 2.1 below.

Follow-up Actions when Pesticides are Detected

The number of detections in 2014 has increased from the numbers reported in 2013. There remain catchments and water treatment works where NI Water has identified pesticides as a high or medium risk within its risk assessments.

NI Water is required to investigate and report all pesticide contraventions. The investigation will include liaison with the NIEA's Pollution Control Team regarding pesticide usage and control within the relevant catchments, along with reviewing the identified control measures within the catchment, and the water treatment works processes. The outcomes from these investigations are then used to reassess the risk categorization for pesticides.

NI Water must have in place appropriate remedial measures to mitigate against the risk of elevated pesticide levels in the catchment making their way through its treatment processes and into the drinking water supply.

Table 2.1: Pesticides Detected above the Regulatory Standard in Treated Water 2011 - 2014

Water Treatment Works		2014		2013	2012					2011
		Clopyralid	MCPA	MCPA	Linuron	MCPA	Mecoprop	Metoxuron	Total Pesticides	MCPA
W1302	Lough Fea	✔				✔				
W1303	Dungonnell	✔								
W1701P	Ballinrees					✔				
W2509	Clay Lake	✔		✔		✔		✔		
W2514	Seagahan			✔		✔	✔			
W2706	Camlough		✔							
W2802	Carran Hill					✔				
W3317	Dorisland	✔	✔	✔		✔				✔
W4306	Caugh Hill				✔				✔	
W4501	Derg		✔	✔		✔				✔
W4701	Killyhevlin	✔	✔	✔		✔				✔
W4722	Belleek		✔							✔

There are a range of measures NI Water has in place to help ensure levels of pesticide remain below the regulatory standard in water leaving a water treatment works, these can include:

- measures to influence the usage/application and disposal of pesticides within the catchment (e.g. land use management, liaison with stakeholders through local working groups);
- developing Catchment Management Plans and implementing sustainable catchment management solutions;
- use of monitoring data and risk assessments in balancing flows and abstraction points to reduce the risks of increased pesticides during periods of high risk (e.g. following heavy rainfall); and
- maintaining, optimizing, and where required installing treatment for the removal of pesticides (e.g. GAC).

NI Water uses granular activated carbon (GAC) filters at a number of its water treatment works to reduce the levels of pesticides in drinking water. As part of its operational practices, NI Water has a programme of GAC monitoring to determine when a GAC filter is required to be taken out of service to allow for carbon renewal or regeneration. It is important that NI Water closely manages the condition and operation of the GAC filters to ensure they are operating effectively.

The presence of pesticides, within a catchment, can be due to a number of factors. The two examples below relate to pesticide detections found in the large catchment area of Lower Lough Erne which supplies Belleek WTWS, and the small catchment area of Camlough WTWs.

Belleek WTWs and Catchment

Belleek WTWs abstracts on average 1.9Ml/day of water from Lower Lough Erne. The surrounding catchment, covering an area of 2,442km^2, is predominantly pasture containing areas of forest, bogs and marshlands. A number of towns and villages are also found within the catchment area.

The WTWs uses powdered activated carbon (PAC) dosing as a treatment option, but given the levels of MCPA detected at the Works, this treatment would be ineffective at reducing the levels of pesticide below the regulatory limit. The risk assessment scored low risk for MCPA, however following these contraventions the risk assessment score and categorisation for MCPA has increased to medium risk. Further remedial measures will be required to be considered by NI Water to lower the risk of MCPA contraventions at the WTWs.

Camlough WTWs and Catchment

Camlough WTWs abstracts on average 3.7Ml per day from Camlough Impounded Reservoir. The catchment area is approximately 12km^2, consisting mainly of grassland, heath and pasture, with some mixed land use and a small area of forestry.

In 2014, MCPA was detected in final water samples taken from Camlough WTWs. Investigations by NI Water to trace any pesticide use within the catchment area found high levels in one of the feeder streams supplying the impounding reservoir and the information was passed on to the NIEA Pollution Team for further investigation.

Camlough WTWs uses GAC filtration in its treatment process and this was in operation at the time of the contraventions. There was no previous history of pesticide detections and the risk assessment scored low risk for MCPA. However following these contraventions the risk assessment score and categorisation for MCPA has increased to medium risk. Further remedial measures will be required to be considered by NI Water to lower the risk of MCPA contraventions at the WTWs.

There were six other catchments in 2014 which required NI Water to investigate pesticide contraventions. These were:

Clay Lake WTWs and Catchment

This catchment covers an area of about 5km^2, where the main activity within the catchment is from farming practices. NI Water's risk assessment indicates a high risk from pesticides within the catchment with contraventions reported in 2012 and 2013.

In 2014, a contravention for the pesticide, Clopyralid was reported. This pesticide is difficult to remove during the treatment process, with GAC only being partially effective. A catchment management study is being undertaken during 2014/15, along with further investigations into a more robust treatment process to reduce Clopyralid levels in the final water.

Derg WTWs and Catchment

This is an extensive river catchment covering an area greater than 320km^2, with the upper reaches of the catchment within the Republic of Ireland. Activities within the catchment are predominantly livestock farming, with areas of forest, bogs and heath land. The Risk Assessment has identified pesticides as high risk in the catchment for the Derg WTWs and as medium risk following treatment.

There are five GAC filters at the WTWs for the removal of pesticides but this treatment has been shown to be ineffective at reducing pesticide levels below the regulatory standard. An enforcement notice was issued in early 2015 which required

NI Water to outline the steps it intended to take to bring the supply into compliance. During 2014, NI Water has continued to work within the Water Catchment Partnership to promote and raise awareness of best practice when using pesticides in the garden or on the farm. It also continues to liaise closely with NIEA to better identify any feeder streams which may pose a higher risk of pesticide loading within the River Derg.

Dorisland WTWs and Catchment

The catchment for Dorisland Impounding Reservoir is approximately 30km^2, which is impacted from three other surrounding reservoirs. Within the catchment there is a mixture of land use including, pasture, forest, grassland and heath.

The recurring presence of pesticides within the catchment for Dorisland WTWs is identified as a high risk within the risk assessment for both the catchment and the treatment. Following a Provisional Enforcement Order (PEO) issued in 2013, NI Water was required to install additional treatment in the form of GAC filters. These filters were constructed during the PC13 period and are now fully operational.

Dungonnell WTWs and Catchment

The Dungonnell catchment covers an area of 4.7km^2, with a number of streams and rivers feeding into an impounding reservoir. The direct catchment around the reservoir consists entirely of bogs and marshes.

The catchment historically has a low risk of pesticide use which is reflected in the risk assessment for Dungonnell WTWs throughout the supply chain from source to tap. The works, therefore, does not have specific treatment in place for pesticide removal. However, in December 2014 the pesticide Clopyralid was detected in the water leaving the works. The cause of this contravention remains undetermined, but NI Water is to review its risk assessment following this pesticide detection.

Killyhevlin WTWs and Catchment

The catchment uses Upper Lough Erne as its raw water source which is fed from a number of streams and rivers. The Lough has an extensive catchment area of 1,521km^2 consisting predominantly of pasture with areas of forest, bogs, marshland and extensive water bodies.

The risk assessment for Killyhevlin WTWs and catchment have identified that pesticides are a high risk in the raw water, and a medium risk in the final water. NI Water are in the process of installing GAC filters to tackle both taste & odour problems, as well as to mitigate against pesticides. The construction of these filters was ongoing during the PC13 investment period and the final work to bring the filters into operation will now fall into the first period of the PC15 programme.

Lough Fea WTWs and Catchment

The catchment around the Lough Fea impounding reservoir is predominantly bogs and marshes with a small area of forest, and an area of mixed land use including quarrying. The combined catchment area is approximately 11.5km^2.

Lough Fea WTWs had a previous detection of the pesticide MCPA in 2012, and in December 2014 the pesticide Clopyralid was detected in the water leaving the works. The risk assessment had classified the pesticide risk as low, but the classification is currently being reviewed following the contravention in 2014.

Manganese

Elevated levels of manganese can be present within raw water sources obtained from surface water bodies, such as lakes, and impounding reservoirs. This normally occurs as a consequence of changes in the temperature profile within the body of water which can lead to an elevation in the manganese levels. Where the treatment processes at a works have insufficient capability to remove these levels of manganese, contraventions of the regulatory standard are likely to occur. In such cases, NI Water is required to review its operational practices and water treatment processes and put in place appropriate remedial measures.

In 2014, there were elevated levels of manganese within the raw water source to Camlough WTWs which led to contraventions of the manganese standard going into Camlough Newry West Water Supply Zone. A Consideration of Provisional Enforcement Order was issued in June 2014, and undertakings were subsequently accepted by DWI, which detailed the remedial measures being taken by NI Water. These measures included ensuring the water leaving Camlough WTWs was blended with water from Castor Bay WTWs to reduce the levels of manganese to below the regulatory standard.

Catchment Protection

The protection of the catchments from which our drinking water supplies are abstracted is key to both reducing the risks from contamination and ensuring the delivery of safe, clean drinking water. There are a number of key measures which influence how catchments are protected and managed.

- The Water Framework Directive (WFD) - requires River Basin Management Plans (RBMPs) to be in place for each water body and has a further requirement to ensure Drinking Water Protected Areas (DWPAs) are established and monitored. These provisions help protect catchments through putting in place programmes of measures to ensure there is no deterioration in the quality of our water bodies along with measures to improve the quality where it falls below standards. It also provides for a monitoring regime to establish baselines and to monitor for changes in water quality. Protecting the water in areas from which it is abstracted not only improves the quality of untreated water but can also mitigate against the potential for additional water treatment and purification processes.

- NI Water Measures - the company has in place a series of measures to help protect and improve the water quality within its catchments, which include: Risk Assessments; Catchment Management Plans (CMPs); and Sustainable Catchment Management Planning (SCaMP). In gathering the evidence to support its risk assessment, NI Water is required to assess each abstraction source and to have in place a monitoring programme to reflect the level of risk within the associated catchment. NI Water also has in place CMPs for each treatment works. These assess the condition of its catchments and identify actions to maintain and enhance water quality. Some of these measures will form part of its SCaMP programme, which includes long term sustainable solutions to improve catchment water quality.

NI Water and NIEA work together in developing their plans in protecting drinking water catchments, they also actively engage with other key stakeholders through working groups to ensure a collaborative approach in bringing forward catchment protection measures.

Drinking Water Protected Areas (DWPAs)

Surface waters which are abstracted for the production of drinking water for both public and private drinking water supplies are required to be identified and mapped, as DWPAs, within NIEA's river basin management plans. Under Article 8 of the Water Framework Directive (WFD), there is a requirement to put in place an appropriate sampling programme to monitor substances discharged within DWPAs that may cause deterioration in the status of the water body

As part of the WFD requirements, NIEA has in place three River Basin Management Plans (RBMPs) which cover Northern Ireland: the North Eastern; the North Western; and the Neagh Bann. These plans detail the water environment within each area. They also provide information on the measures referred to as the Programme of Measures (POMs) that are required to be put in place to monitor and improve the status of the water body. There are nine surface water bodies and 48 river systems designated as DWPAs in Northern Ireland. NIEA may designate safeguard zones within a DWPA as part of its cycle of monitoring and review, to address specific identified contamination risks.

NI Water has a regulatory requirement to have an up to date risk assessment in place for each water supply system, which must be reviewed as part of the cycle of assessing the monitoring data from the raw water source, along with the ongoing assessment of risks within the catchment. It is important that NI Water's risk assessments, associated catchment management plans, and raw water sampling programmes are closely aligned to provide a holistic approach to the management of its catchments.

Part 3
Water Treatment

Image: Dorisland Water Treatment Works – NIEA

Part 3
Water Treatment

- 25 water treatment works (WTWs) were in operation producing high quality drinking water
- Of the 19,605 compliance tests at WTWs, 99.93% met the required standards
- 50 events occurred at WTWs, 29 of which were categorised as Significant
- Treatment related issues remain the primary reason for contraventions from WTWs

NI Water must ensure that the treatment processes it has in place at each water treatment works (WTWs) are robust and designed to deal with the range of raw water quality which could occur within the water source.

In Northern Ireland, surface waters provide the main source for drinking water supplies. Water treatment processes are used as barriers to control the risk of contaminants entering water supplies.

Water treatment processes include the physical removal of potential contaminants by using chemical coagulation/flocculation, sedimentation or flotation, and filtration to prepare the water for disinfection. Figure 3.1 shows the flotation stage, and Figure 3.2 the primary filtration stage of the treatment process. The primary aim of water treatment is to eliminate any pathogenic micro-organisms and provide a safe, clean drinking water supply.

The drinking water safety plan (DWSP) approach requires an assessment to be made between the source water and the type of water treatment in place at each water treatment works. This assessment should identify and quantify the risks within the source water and ensure that appropriate remediation measures are in place to reduce these risks. These measures involve suitable water treatment processes being in place to deal with the specific risks within each source. They should take into account the wide variations in the quality of the source water caused by seasonal change and adverse weather. The risk assessment should also take account of the risks which may be encountered within the treatment processes and proper controls should be in place to mitigate these.

One important measure of the effectiveness of treatment is the assessment of the water quality throughout the treatment process and the quality of the final water leaving the works and entering distribution. In Table 3.1, groupings of two sets of parameters are used to describe the effectiveness of water treatment processes: process control parameters; and disinfection parameters.

Process Control Parameters

Process control parameters are used to measure the effectiveness of water treatment, and are based on a selection of chemical parameters which are influenced, in general terms, by the processes in place at the water treatment works.

In 2014, results from the regulatory monitoring programme shown in Table 3.1 report non-compliance occurred for two of the process control parameters, trihalomethanes (THMs) and aluminium.

Figure 3.1: Flotation Stage

Figure 3.2: Primary Filtration Stage

The implementation of best practice in the operation of WTWs is critical in ensuring a continuation in the supply of high quality drinking water regardless of variations in the raw water quality. It is important that there is appropriate monitoring and control of the treatment processes in place and that appropriate levels of maintenance are maintained.

The implementation of DWSPs highlights that good operational monitoring is fundamental to assess whether the control measures in a WTWs are operating effectively. NI Water monitors critical parameters at different stages of the water treatment process to ensure process control is effective.

Trihalomethanes (THMs)

THMs are a group of disinfection by-products that form when organic substances combine with chlorine, which is added to disinfect the water and make it microbiologically safe to drink. Organic substances originate in the source water and are not completely removed by water treatment processes. The less effective treatment is, the more organics remain in the water, and the higher the level of THMs that occur in the final water.

THM compliance improved in 2014, with four samples (1.02%) contravening the standard (100µg/l), compared to 6 (1.52%) in 2013. NI Water must fully consider the formation of THMs and other disinfection by-products as part of its overall disinfection policy. Where possible, without compromising disinfection, NI Water must continue to keep all disinfection by-products, including THMs, to as low a level as possible. Figure 3.3 displays the levels of THM compliance at consumers' taps over the last five years. Although there has been an upward trend since 2012, percentage compliance for THMs in 2014 is still below the 2011 figure.

Aluminium

Aluminium compliance, which is measured at consumers' taps, improved in 2014: there were four contraventions (0.21%) compared with the nine (0.48%) that occurred in 2013. NI Water attributed three contraventions to disturbance of mains deposits: one due to unauthorised usage of a hydrant; one due to operational work to replace a hydrant; and one of unknown origin. No cause was determined for the fourth contravention. While regulatory compliance has improved in 2014, problems with the treatment processes are not always discovered through the compliance sampling programme. This is evidenced by three Significant water quality events at WTWs in 2014 relating to elevated levels of aluminium.

Operational sample results and traces from on-line monitors often highlight elevated aluminium levels at WTWs before they become apparent in distribution. In many cases the remedial measures taken by NI Water in response to these early detections, limit the impact of a water quality event on the public drinking water supply. Figure 3.3 demonstrates the levels of aluminium compliance over the last five years.

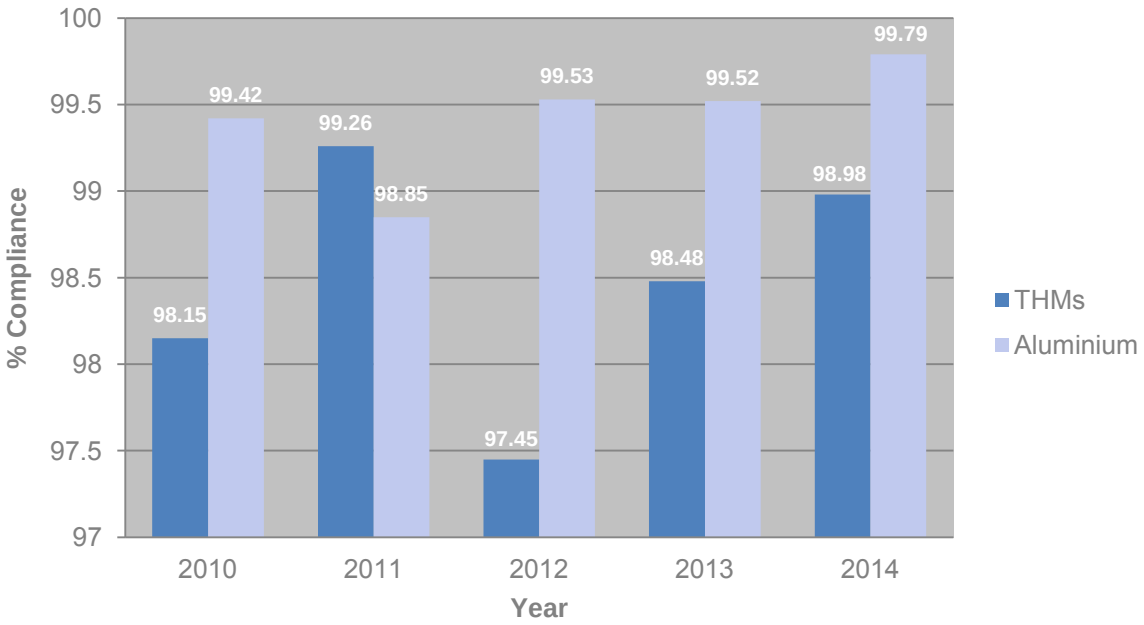
Disinfection Parameters and Disinfection Statements

The coliform bacteria, *E. coli* and turbidity parameters (Table 3.1 refers) look at the effectiveness of disinfection and pathogen removal. To safeguard drinking water from the risk of microbiological organisms being present, effective disinfection is fundamental to treatment works' operation. NI Water must achieve its primary duty of disinfecting drinking water before it is supplied to consumers.

Table 3.1: Water Quality at Water Treatment Works, 2014

Parameters	Place of Sampling	Total No. of Tests in 2014	No. of Tests not Meeting the Standards in 2014	% of Tests Meeting the Standards	
				2014	2013
Process Control Parameters					
Trihalomethanes	WSZ	391	4	98.98	98.48
Aluminium	WSZ	1,896	4	99.79	99.52
Disinfection Parameters					
Coliform bacteria	WTWs	6,460	2	99.97	99.89
E. coli	WTWs	6,460	0	100	99.95
Turbidity	WTWs	6,460	11	98.83	99.73

Figure 3.3: Percentage of Tests Meeting the Regulatory Standards for THMs and Aluminium at Consumers' Taps, 2010 - 2014



NI Water has disinfection statements in place at each water treatment works which detail the necessary requirements to ensure effective disinfection. During 2014, NI Water has been investigating the development of its disinfection statements to cover the distribution systems related to each WTWs. These extended statements should consider where NI Water boosts chlorination within the distribution system and operational practices in relation to retention times and cleaning regimes within the distribution system.

In 2014, there were two enforcements against NI Water relating to disinfection: a failure to disinfect the water leaving Drumaroad WTWs; and insufficient controls on the disinfection process at Rathlin WTWs.

E. coli and Coliform Bacteria

Testing for *E. coli* and coliform bacteria at water treatment works provides a level of assurance that water is being treated adequately to remove bacterial and viral pathogens. However, NI Water must not rely solely on its testing programme but should also monitor and review its operational practices and other control measures, such as its disinfection statements for each WTWs to ensure disinfection processes are adequately maintained and are effective.

In 2014, NI Water reported 100% compliance for *E. coli* and 99.97% compliance for coliform bacteria at water treatment works.

Figure 3.4: Microbiological Analysis

Turbidity

The regulatory standard for turbidity leaving a water treatment works is 1NTU. The finely suspended particles which cause turbidity in water must be removed by effective water treatment in preparation for the disinfection process. Where treatment is inadequate or there is disturbance during onward transmission and storage, these particles may increase turbidity levels in the water going into supply.

As well as being a regulatory requirement, it is also considered good operational practice to ensure that a turbidity value below 1NTU is achieved post treatment to ensure effective disinfection.

There was a slight improvement in compliance with the turbidity standard in 2014 (99.83% in 2014; 99.73% in 2013). Turbidity contraventions occurred at seven (28%) water treatment works in 2014. Of the 6,460 samples taken for turbidity analysis from WTWs, 11 (0.17%) failed to meet the standard.

Of these failures, NI Water's subsequent investigations indicated that: eight were due to unrepresentative sampling; two were related to operational activities which caused disturbances of sediment in the Clear Water Tanks; and one was caused by a temporary loss of effective treatment.

Indicator Parameters

Clostridium perfringens

The Regulations require monitoring for *Clostridium perfringens* as an indicator parameter, and it can be used in association with other parameters to assess the efficiency of water treatment processes. This organism is a spore-forming bacterium that is exceptionally resistant to unfavourable conditions in the water environment such as extremes of temperature and pH; and disinfection by chlorination.

In 2014, 2,261 tests were carried out for *Clostridium perfringens* on samples collected from water treatment works. Six (0.27%) contravened the standard: two at Castor Bay WTWs and one each at Ballinrees, Drumaroad, Dunore Point and Fofanny WTWs. Investigations by NI Water were unable to identify the cause of the contraventions at these WTWs. There were no issues identified with the water treatment processes and all follow-up samples were satisfactory.

Events

During 2014, 50 events were notified to us that related to water quality going into supply from water treatment works: these were categorised as 29 Significant; and 21 Minor or Not Significant.

There were 29 Significant events at 16 (64%) WTWs in 2014: Altnahinch; Ballinrees; Belleek; Camlough; Carmoney; Caugh Hill; Clay Lake; Derg; Dorisland; Drumaroad; Dungonnell; Killyhevlin; Killylane; Lough Bradan; Lough Fea; and Lough Macrory. The majority of these were related to difficulties with the performance of the coagulation processes, or deficiencies at the WTWs which led to: aluminium; hydrogen ion (pH); iron; pesticide; taste and odour; THMs; and turbidity contraventions.

Details of all water quality events in 2014 are provided in Annex 4.

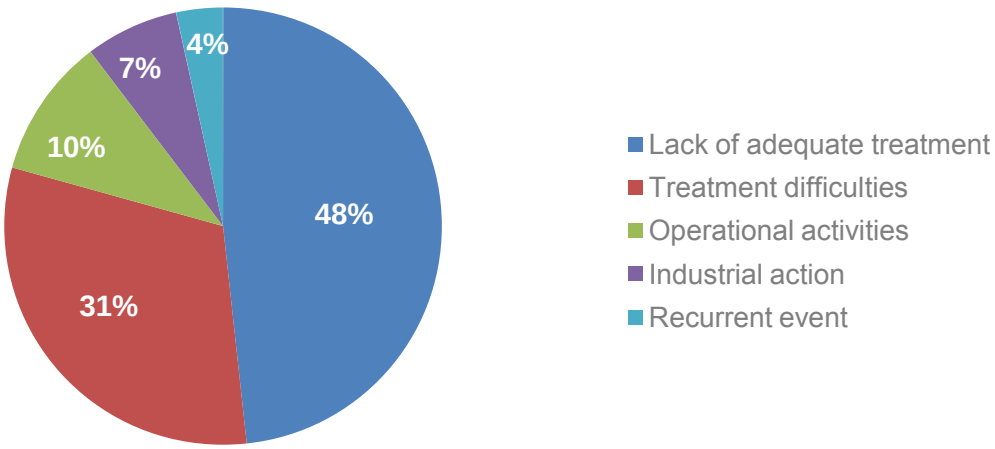
Drinking Water Quality Improvements

Enforcement Action at WTWs

In 2014, we issued one Consideration of Provisional Enforcement Order (CPEO), one Provisional Enforcement Order (PEO) and one Regulation 28 Notice to address specific non-compliances at WTWs. These related specifically to the presence of recurring manganese contraventions at Camlough WTWs and inadequate disinfection at Drumaroad WTWs & Rathlin WTWs.

Further details on our enforcement action are provided within Annex 6.

Figure 3.5: Main cause of Significant Events at WTWs in 2014



Treatability Studies

In 2014, NI Water completed a series of treatability studies at five water treatment works which had been prioritised through its risk assessment process. The five works were: Carmoney WTWs; Caugh Hill WTWs; Dorisland WTWs; Glenhordial WTWs; and Killyhevlin WTWs. NI Water considered the outcomes from these studies and identified where improvements to treatment processes were required. These were detailed in its submission to the Utility Regulator during the PC15 price control process.

Within its submission to the Utility Regulator for PC15, NI Water have identified a further 13 WTWs where treatability studies are to be undertaken during the six year investment period from 2015 to 2021.

Part 4
Water Distribution Systems

Image: *NIEA*

Part 4
Water Distribution Systems

- Service Reservoir water quality remains high: overall microbiological compliance of 99.93%
- Lead is the parameter with the lowest level of compliance at consumer taps (97.45%)
- Enforcement action taken to improve drinking water quality: hydrogen ion in the Dungonnell Ahoghill supply area
- NI Water continues to deliver its mains rehabilitation programme to improve its distribution network

The water distribution system in Northern Ireland is an extensive and complex network, consisting of 302 service reservoirs (SRs) and approximately 26,700 km of mains pipe, which facilitate the delivery of treated water from the water treatment works to the point of supply to the consumer. Service reservoirs provide storage close to the point of distribution to help ensure that sufficient water is available to meet the varying demands of consumers.

The water quality in the distribution system depends on the structural integrity of the distribution system, the materials it comes into contact with and the nature of the water itself. For example, service reservoirs whose structural integrity has not been maintained are at risk from ingress of contaminants and old cast-iron pipes which have corroded over time may result in sediment being deposited under low flow conditions. An increase in flow rate or operational activity can cause disturbance to the mains network, which may result in particles being re-suspended and transported through the system, resulting in discoloured water at the tap.

Monitoring the quality of the water using indicator parameters is important for identifying potential deficiencies with the integrity of the service reservoirs, and within the distribution system. In Table 4.1, two measures are used which describe the water quality within a distribution system: reservoir integrity, and distribution networks. The selection of these distribution parameters is to reflect the age, condition and maintenance status both of the reservoirs and the pipes (water mains) which comprise the distribution networks.

Microbiological Quality

Water entering the distribution systems must be microbiologically safe. The distribution system itself must have sufficient controls in place to prevent contamination of drinking water supplies, as the water is delivered to the user. An overview of a typical service reservoir is shown in Figure 4.1.

Service reservoir integrity should be maintained at all times. The prevention of stagnation throughout the distribution system is also a way of controlling potential contamination. A disinfectant residual is maintained throughout the distribution network to provide ongoing protection against recontamination and limit the potential for microbial growth problems.

Table 4.1: Water Quality Indicators within the Distribution System

Parameters	Place of Sampling	No. of Tests in 2014	No. of Tests not Meeting the Standards in 2014	% of Tests Meeting the Standards in 2014	% of Tests Meeting the Standards in 2013
Reservoir Integrity					
Coliform bacteria	SR	15,640	17	99.89	99.84
E. coli	SR	15,640	4	99.97	99.98
Distribution Networks					
Turbidity	WSZ	1,896	3	99.84	99.79
Iron	WSZ	1,896	20	98.95	98.08
Manganese	WSZ	1,896	3	99.84	99.73

NI Water carries out additional disinfection (often referred to as 'secondary disinfection') through chlorine boosting at selected service reservoirs, particularly those with long distribution networks. This additional disinfection is necessary to maintain the good water quality achieved at the water treatment works, but NI Water must ensure its disinfection policy limits the formation of disinfection by-products e.g. trihalomethanes (THMs), without compromising the microbiological quality of the water.

Figure 4.1: Service Reservoir

It is imperative that this 'secondary disinfection' does not disguise a more fundamental problem such as compromised reservoir integrity because of the structural condition of the reservoir or the hydraulic flow of water through the system. NI Water should have in place appropriate control measures to ensure that an adequate disinfection residual is effectively maintained throughout the distribution network. This has been incorporated by NI Water within its drinking water safety plans and disinfection statements for individual WTWs.

NI Water is committed to extending the use of disinfection statements to cover secondary disinfection within its distribution systems. In response to enforcement initiated by us in relation to elevated levels of disinfection by-products within the Lough Bradan distribution system, the first disinfection statement covering secondary disinfection within this distribution system was completed in 2013. Following enforcement action taken by us in relation to ongoing microbiological failures within the Dunore Point Water Supply System in 2013, NI Water completed a second disinfection statement to cover this distribution system in 2014.

E. coli at Service Reservoirs

In 2014, a total of 15,640 samples for *E. coli* testing were collected at service reservoirs across Northern Ireland. *E. coli* was detected in four of these samples at four different service reservoirs as was also the case in 2013.

On detecting *E. coli*, NI Water must act promptly to protect public health and ensure that the water being received by consumers is safe. One contravention was related to low level contamination from ingress at a reservoir which is scheduled for removal from service in autumn 2015 (chlorine boosting is being carried out in the interim period). NI Water attributed the other three contraventions to contamination at time of sampling. There have been no further *E. coli* contraventions at these four reservoirs to date.

Coliform Bacteria at Service Reservoirs

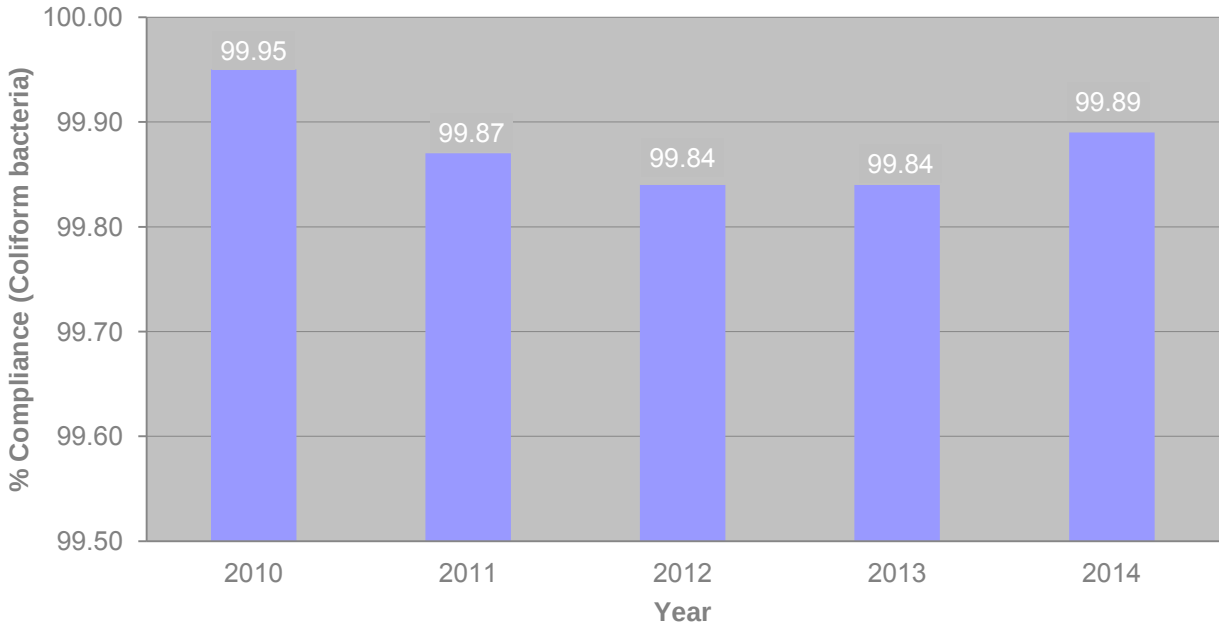
Samples are collected weekly at every service reservoir in Northern Ireland. It is a regulatory requirement that at least 95% of samples collected from each service reservoir are free from coliform bacteria. All 302 service reservoirs sampled in 2014 met this regulatory requirement. However, coliform bacteria were detected on 17 occasions at 17 (5.6%) different service reservoirs. This is an improvement on 2013, when coliform bacteria were detected on 26 occasions at 24 service reservoirs (see Figure 4.3).

Reservoir Integrity

We assess reservoir integrity based on the microbiological quality of the water. The detection of microbial pathogens may suggest that the structure of the reservoir has been breached and these instances should be investigated further by NI Water. NI Water must have a programme in place to ensure all service reservoirs are cleaned and checked for integrity on a regular basis. NI Water must also have a disinfection policy in place that ensures a residual disinfection is maintained throughout the distribution system for the protection of human health.

Figure 4.2: Protective cover on access point to Service Reservoir

Figure 4.3: Percentage Compliance of Coliform Bacteria at Service Reservoirs 2010 – 2014

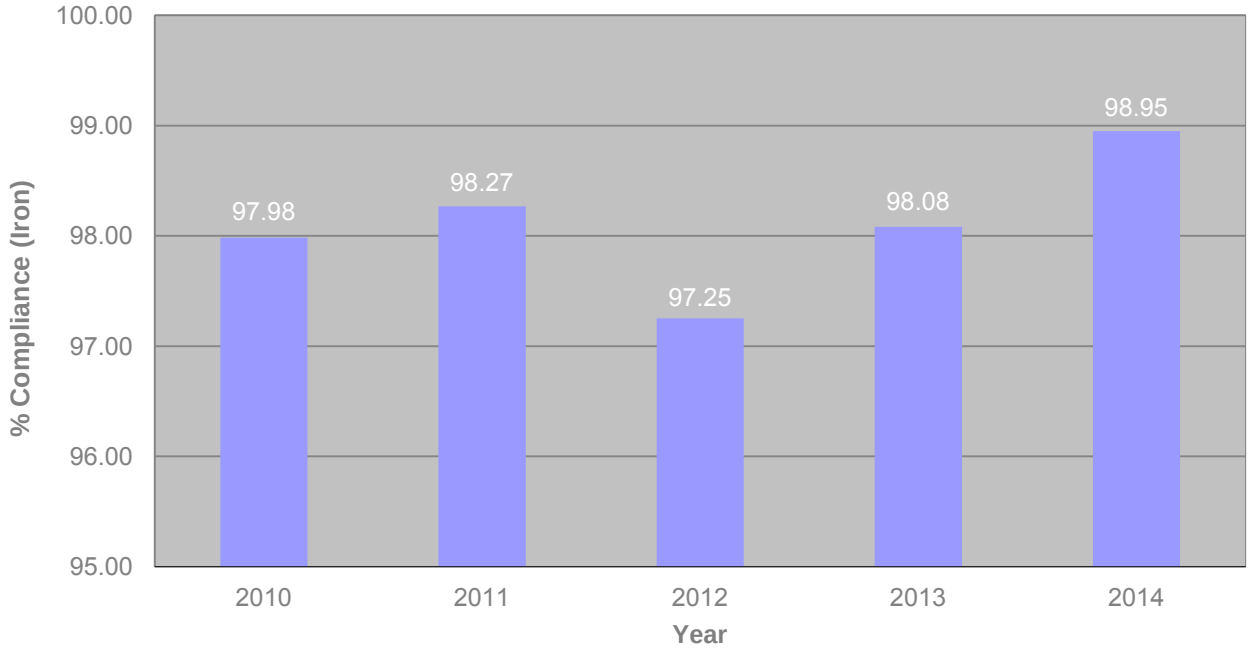


Distribution Networks - Iron

NI Water has an extensive network of iron water mains across Northern Ireland, stretching for thousands of kilometers. In 2014 a total of 1,896 samples taken from consumers' taps were tested for iron. Of these, 20 (1.05%) contravened the iron standard. This is an improvement on 2013 when 1.92% contravened the standard (see Figure 4.4).

Water quality issues frequently arise in the network due to problems caused by the corrosion of older iron water mains. NI Water has an ongoing Water Mains Rehabilitation Programme in which water supply zones that experience water quality and other supply problems are subjected to detailed studies to enable prioritized corrective action to be taken to improve the water quality being supplied to consumers.

Figure 4.4: Percentage Compliance of Iron in Distribution 2010 - 2014



Drinking Water Quality Improvements

Mains Rehabilitation Programme

NI Water's mains rehabilitation programme restores or replaces the existing water mains pipe work (see Figure 4.5). The criteria by which pipe work is prioritized for replacement under this programme takes into consideration many factors, including water quality, water pressure, leakage, bursts, consumer complaints and sufficiency of supply. Many of the mains delivering water to consumers' taps are made of cast iron and the deterioration of older water mains may result in consumers receiving discoloured drinking water due to the presence of iron and manganese.

Unfortunately water quality events can sometimes occur during Mains Rehabilitation work. In October 2014, NI Water notified us of an event in the Ballymurphy Road area of Belfast following the installation of a new section of main. A number of coliform bacteria contraventions occurred in samples taken to check the water quality after the work was completed. Our assessment was that some low-level contamination occurred during the installation of the new section of mains. The event was categorized as Not Significant as a small number of properties were affected and further samples taken in response to this event were satisfactory. Details of all water quality events in 2014 are provided in Annex 4.

Figure 4.5: New Mains Installation

Enforcement Action within Distribution Systems

In order to protect, maintain and improve drinking water supplies, NI Water continues to complete infrastructure, treatment and distribution projects. These programmes of work although mainly driven by NI Water's assessment of need may also be driven by remedial actions relating to, Enforcement Orders, Notices and other regulatory processes.

During 2014, we issued one Consideration of Provisional Enforcement Order (CPEO) to address specific contraventions within the distribution system of Dungonnell Ahoghill water supply zone. This CPEO related to contraventions of the hydrogen ion parameter (pH), resulting from a failure, by NI Water, to comply with the national condition of use for cement mortar lined pipes. (Refer to Annex 6 for further details).

Part 5
Consumers' Taps

Image: *NIEA*

Part 5
Consumers' Taps

- Overall quality of 'consumers' taps' water remains high. Of 51,151 samples, 99.78% complied
- 12 parameters did not achieve full compliance at consumers' taps
- Microbiological quality at consumers' taps reports an improvement to 99.73%
- Lead is the parameter with the lowest compliance at 97.45%
- Five lead treatment zones did not achieve 98% compliance with the 10µg/l standard
- Consumer contacts on drinking water quality decreased by 11% but discoloured water remains the main issue of concern to consumers

Once water has passed through NI Water's distribution network, it will then come into contact with water systems within buildings. These systems can be those in individual domestic properties or in larger commercial or public premises. In undertaking its risk assessments, NI Water must take account of the potential for the water it supplies to become contaminated by these systems through, for example, the condition and maintenance of the pipe-work or storage facilities. NI Water's sampling programme within water supply zones is randomly generated to take samples from consumers' properties. NI Water must keep a record of the type of property the sample was taken from (e.g. a residential property or a public building).

The Regulations require that sampling must take place at consumers' drinking water taps. Some of the parameters such as lead, copper, and nickel that are monitored for at consumers' taps may be influenced by the nature and condition of water distribution systems in buildings.

In instances where water quality issues have been identified as being caused by the distribution system within a building, NI Water is required to investigate to determine the cause. Under the Domestic Distribution Systems Regulations, where this water quality issue is within a building where water is available to the public (such as a school, hospital or restaurant), we have a responsibility to ensure that the necessary remedial action is taken by the owners to ensure that the water supply is safe and clean.

Drinking Water Quality

To assess the overall quality of water that is being supplied to consumers, we look at the results of samples taken by NI Water from the regulatory sampling programme for consumers' taps. In Table 5.1 we record the percentage compliance for 38 Schedule 1 (mandatory) parameters and nine Schedule 2 (indicator) parameters. For 2014, overall drinking water quality at consumers' taps has improved slightly from 99.74% in 2013 to 99.78%. This slight statistical improvement is contrary to the experience some consumers report regarding the quality of water supplied to them. The overall number of contacts in 2014 decreased by 11% compared to 2013, returning to a level similar to previous years. However, discoloured water remains as the main water quality issue of concern for consumers who contacted NI Water in 2014.

Chemical/Physical Quality

Lead

In 2014, lead was the parameter with the lowest percentage compliance (97.45%). However, this is the first year that regulatory compliance for lead has been assessed against the 10µg/l standard that applied from 25 December 2013. An interim standard of 25µg/l applied from 2003 to 2013.

Meeting the lead standard is a complex matter because, although some lead pipes are owned by NI Water, most belong to consumers, i.e. building owners. Many older properties still have service pipes and internal plumbing, wholly or partly, comprised of lead (the installation of lead pipes has been banned since the early seventies) or have lead solder on copper pipes (the use of lead solder on pipes used for drinking water has been banned since the eighties).

Table 5.1: Consumer Tap Compliance 2014

	Number of Samples	Number of samples not Meeting the Standards	% Compliance
Schedule 1 (Mandatory parameters)			
Lead	**392**	**10**	**97.45**
Iron	**1,896**	**20**	**98.95**
Total Trihalomethanes	**391**	**4**	**98.98**
Odour	**1,896**	**14**	**99.26**
Taste	**1,896**	**10**	**99.47**
Aluminium	**1,896**	**4**	**99.79**
Manganese	**1,896**	**3**	**99.84**
Turbidity	**1,896**	**3**	**99.84**
Pesticides - other substances	**7,888**	**10**	**99.87**
E. coli	**5,220**	**1**	**99.98**
1,2 Dichloroethane	391	0	100.00
Aldrin	232	0	100.00
Antimony	392	0	100.00
Arsenic	392	0	100.00
Benzene	391	0	100.00
Benzo(a)pyrene	392	0	100.00
Boron	392	0	100.00
Bromate	392	0	100.00
Cadmium	392	0	100.00
Chromium	392	0	100.00
Colour	1,896	0	100.00
Copper	392	0	100.00
Cyanide	232	0	100.00
Dieldrin	232	0	100.00
Enterococci	392	0	100.00
Fluoride	392	0	100.00
Heptachlor	232	0	100.00
Heptachlor Epoxide	232	0	100.00
Mercury	392	0	100.00
Nickel	392	0	100.00
Nitrate	392	0	100.00
Nitrite	392	0	100.00
PAH - Sum of four substances	392	0	100.00
Pesticides - Total Substances	232	0	100.00
Selenium	392	0	100.00
Sodium	392	0	100.00
Tetrachloroethene/Trichloroethene - Sum	391	0	100.00
Tetrachloromethane	391	0	100.00
Total (Schedule 1)	**36,783**	**79**	**99.79**
Schedule 2 (Indicator parameters)			
Coliform bacteria	**5,220**	**28**	**99.46**
Clostridium perfringens	**2,261**	**6**	**99.73**
Ammonium	1,896	0	100.00
Chloride	392	0	100.00
Conductivity	2,261	0	100.00
Hydrogen Ion	1,896	0	100.00
Sulphate	392	0	100.00
Total Indicative Dose	25	0	100.00
Tritium	25	0	100.00
Total (Indicator parameters)	**14,600**	**34**	**99.77**
Overall Total	**51,151**	**113**	**99.78**

Whether or not the lead standard is contravened at a particular tap depends on a number of factors, an important one being the plumbosolvency of the water (the tendency for lead to dissolve in water). In 2014, of the 392 tests carried out for lead, ten (2.55%) contravened the standard. Five contraventions were most likely related to lead pipe-work belonging both to NI Water and the consumer and five were most likely related to lead pipe-work belonging solely to the consumer (NI Water had replaced their lead communication pipes).

When a sample has contravened the standard and investigations show the property's service pipe contains lead, NI Water notifies the consumer, offering advice on what action they may take, and also notifies the local Environmental Health Officer. It is the owner's decision whether or not to replace their supply pipe and other lead pipes within their property. If they decide to do this NI Water will arrange to replace its part of the service pipe (the communication pipe) at the same time (Figure 5.1 refers).

Improving Compliance with the Lead Standard

The Regulations require NI Water to carry out a programme of measures (water treatment) to reduce the tendency of water supplies to pick up lead from pipes and fittings. A plumbosolvency strategy to deliver improved compliance for lead introduced orthophosphate treatment at all the major water treatment works and this has been ongoing since 2004.Through the use of treatment and lead pipe replacement, the strategy aims to:

- optimize orthophosphate treatment throughout distribution networks;
- continue opportunistic replacement of lead service pipes;
- replace lead pipe work at the request of the consumer or due to a regulatory requirement; and
- replace lead pipe work as part of the mains rehabilitation programme.

Figure 5.1: Potential Sources of Lead detected at Consumer Taps

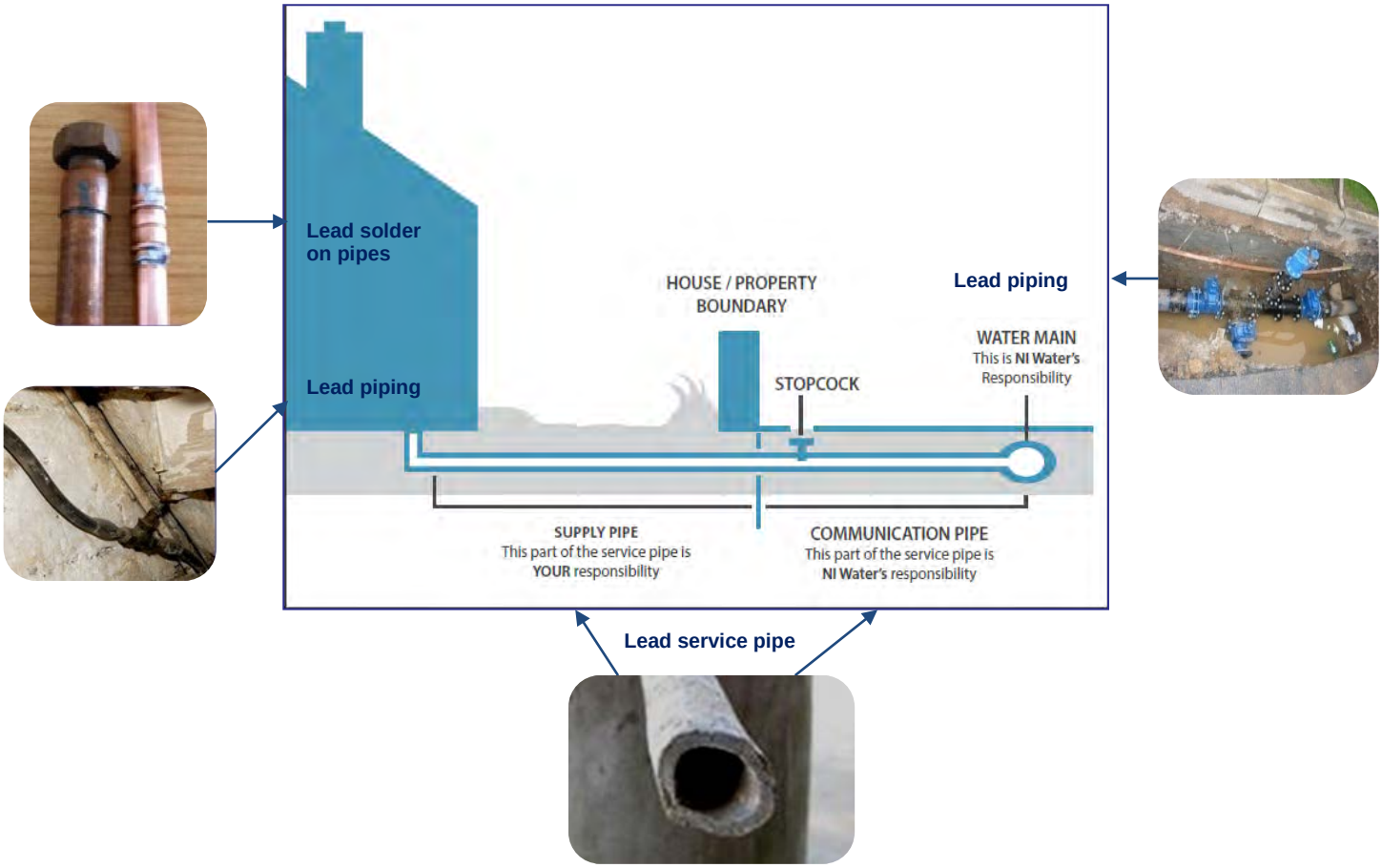
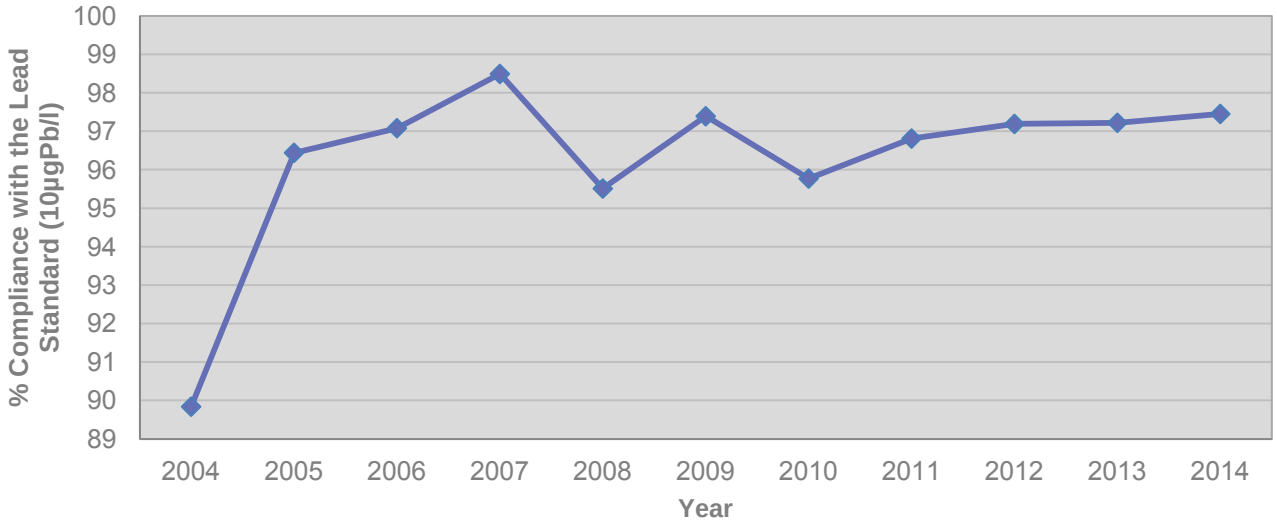


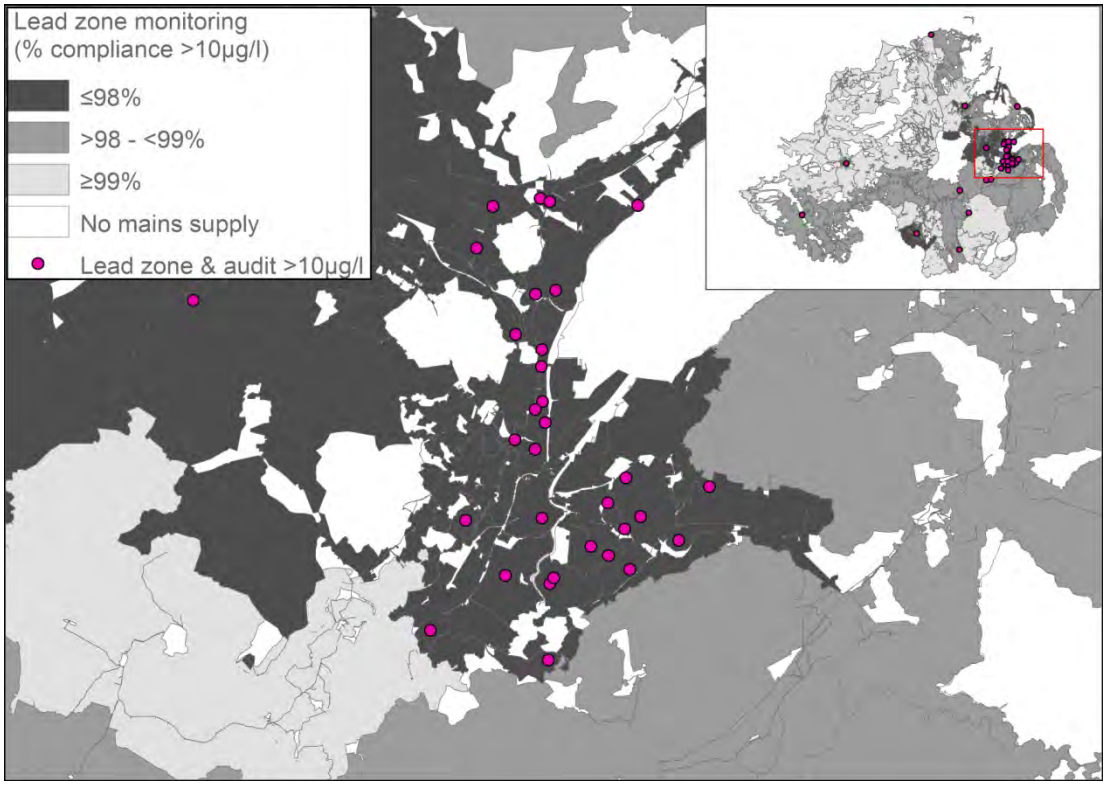
Figure 5.2: Percentage of Tests Meeting the Current Standard for Lead, 2004 - 2014



Looking at the overall trend in lead compliance in Figure 5.2, it is encouraging to see how compliance with the 10 µg/l standard has significantly improved since 2004 following the introduction of orthophosphate treatment (89.84% in 2004, 97.45% in 2014). A significant amount of work is required to further improve compliance with the lead standard in 2015 and beyond.

In addition to the sampling requirements specified in the Regulations, NI Water undertakes a more extensive operational sampling programme for lead. Results from this sampling programme highlight those water supply areas which have not achieved a compliance target of 98%. Five of the 25 lead zones (20%) did not achieve the 98% target: Clay Lake in County Armagh; Dorisland, Dunore, and Dunore/Drumaroad in County Antrim; and Glenhordial in County Tyrone. Figure 5.3 illustrates where the majority of lead contraventions occurred i.e. in the Dunore and Dunore/Drumaroad lead zones which cover the greater Belfast area.
NI Water needs to keep its lead reduction strategy under review to ensure that it is able to demonstrate that treatment processes, including orthophosphate dosing and pH control, have been optimized and are effective.

Figure 5.3: Lead Zone Monitoring Showing Belfast and Surrounding Areas, 2014 - Results >10µg/l



Iron

The regulatory standard for iron has been set for aesthetic reasons because levels above the standard can give rise to discoloured water. The presence of excessive iron may make the appearance and taste of the water unacceptable to consumers. There are various reasons why iron might be present in the water: it may be present in the raw water; it may originate from iron compounds used in the water treatment process; or it can be released as a consequence of the corrosion of iron water mains.

Corrosion of iron water mains is the most common reason for iron contraventions. In 2014, iron was the chemical parameter for which there was the greatest number of tests failing to comply with the regulatory standard. Of the 1,876 samples taken, 20 (1.05%) failed to meet the 200µg/l standard. This is an improvement on 2013 when 1.92% contravened the standard (see Part 4 for more details). Investigations showed these contraventions were mostly due to the build up, and subsequent disturbance, of mains deposits. Where this is identified, NI Water may carry out scheduled flushing programmes to prevent or reduce further occurrences. Areas where these remedial measures are shown to be ineffective are considered for mains rehabilitation.

Trihalomethanes

Trihalomethanes (THMs) arise when chlorine, which is used to disinfect the water and make it microbiologically safe to drink, is added to water containing naturally occurring organic substances. Drinking water in Northern Ireland is predominantly obtained from surface waters, which contain naturally occurring organic materials. The leaching of this organic content into water supplies is affected by seasonal variations.

Water treatment is necessary to remove the organic material prior to disinfection, and optimization of these processes minimizes the production of THMs. Water treatment processes must be robust enough to remove the organic matter which may result from any changes in the raw water quality due to seasonal variations or extreme weather events.

NI Water must fully consider the formation of THMs and other disinfection by-products (DBPs) as part of its overall disinfection policy. Where possible, without compromising disinfection, it has a regulatory responsibility to maintain disinfection processes so as to keep the presence of disinfection by-products, including THMs, to a minimum.

There has been an improvement in THM compliance reported this year (98.98% in 2014 compared to 98.48% in 2013) for our public supplies. Of the 391 tests carried out, four (1.02%) contravened the regulatory standard of 100µg/l.

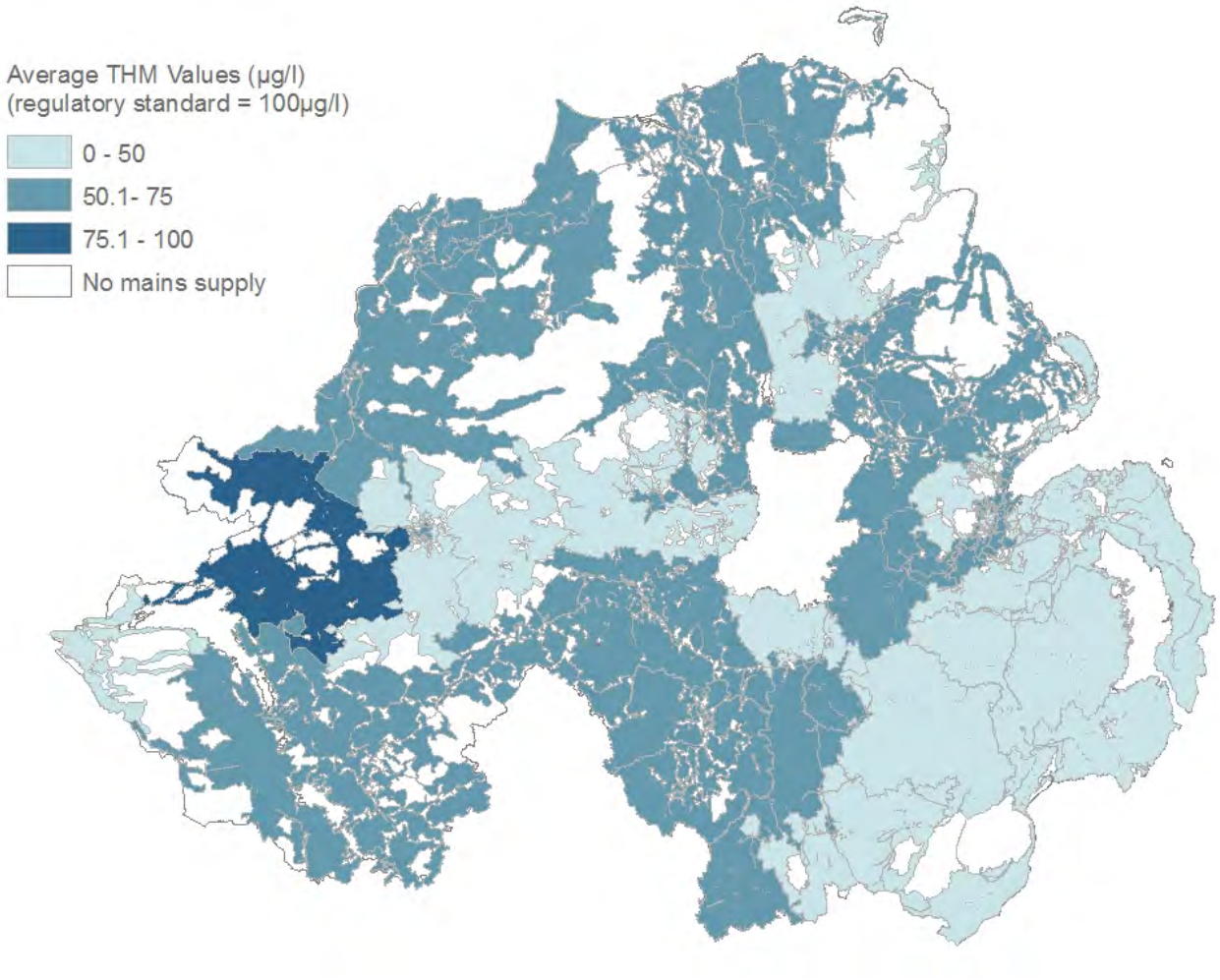
To further evaluate how NI Water is meeting its regulatory requirement to keep the disinfection by-products as low as possible through controlling THM formation, we report that in 2014 the average concentration of THMs was 52µg/l (the highest zonal average being 79.7µg/l) with 60% of zones identified where the annual average exceeds 50µg/l (Figure 5.4 refers). This represents poorer performance than in 2013, when 44% had an annual average greater than 50µg/l and the highest zonal average was 70.8µg/l. We will continue to use this annual average value to assess how NI Water is controlling the level of these disinfection by-products.

The highest zonal average was recorded in the Lough Bradan Drumquin Water Supply Zone, the area supplied by Lough Bradan WTWs. Lough Bradan WTWs has been undergoing an upgrade and water quality should improve when this work is completed.

Odour

Naturally occurring substances which have odour properties are present in many water sources. In the purification of water supplies, the treatment process may remove or introduce odour to the water supply. In addition, odour may develop during storage and in distribution due to microbiological activity. In 2014, of the 1,896 samples taken for odour, fourteen (0.74%) failed to comply with the regulations, marking a deterioration from 2013 (0.33%). Eight of the contraventions occurred in Killyhevlin Enniskillen Water Supply Zone. Some of these odours, described as ‘earthy’ or ‘musty’ may have been due to insufficient treatment being in place for the removal of tastes and odours at Killyhevlin WTWs. Following a previous enforcement, NI Water was funded within PC13 to install an upgrade to the treatment at Killyhevlin WTWs to reduce the risk of contraventions for the taste and odour parameter. The PC13 investment period finished in March 2015, but there remains some carryover work for this upgrade and this will move into the PC15 price control process.

Figure 5.4: Average THM Values in Water Supply Zones across Northern Ireland in 2014



Two odour contraventions described as 'petrol' were related to external contamination, one from contamination of the supply pipe with oil from contaminated land and one from contamination of the sample tap with a lubricant which had been used to loosen a tap fitting. No cause was determined for the other four odour contraventions.

Taste

Taste can occur naturally in water, particularly in surface sources during the summer due to increased biological activity of micro-organisms. Water treatment aims to remove the organic material that may cause taste problems to arise. In 2014, of the 1,896 samples taken for taste, ten (0.53%) failed to comply with the regulations: six of these taste contraventions occurred in water supplied from Killyhevlin WTWs. No specific cause was determined for these contraventions but some may have been related to inadequate removal of organic substances from the raw water at the WTWs as previously discussed in the "Odour" section; one taste contravention was caused by the contamination of the supply pipe with oil from contaminated land; and no cause for the other three taste contraventions was determined.

Aluminium

Aluminium can occur naturally in many water sources, particularly those derived from upland areas. Aluminium compounds are also used as part of the water treatment processes used in the purification of water, including the removal of harmful organisms. In addition to this primary role, aluminium-based water treatment removes naturally occurring aluminium from water. The regulatory standard for aluminium is based on aesthetic considerations because high concentrations in water may cause discoloration.

In 2014, a total of 1,896 samples were tested for aluminium: four (0.21%) contravened the regulatory

standard of 200µg/l. This means the compliance level has improved from 2013 when 0.48% contravened the regulatory standard. NI Water attributed two contraventions to disturbance of mains deposits: one following operational work to replace a fire hydrant and one from unauthorised hydrant use; and no cause was determined for the other two contraventions.

The presence of aluminium in the mains pipes comes from previous water quality events where inadequate treatment or poor control of the coagulation process has led to aluminium passing through the treatment works and into the supply, where it has accumulated in the distribution network. NI Water must ensure that good operational performance is achieved at its water treatment works to ensure a continuous provision of safe, clean drinking water.

Manganese

The regulatory standard for manganese has been set for aesthetic reasons. Manganese occurs naturally in many of Northern Ireland's water sources and is normally removed by effective water treatment. Where treatment is inadequate, manganese and iron can accumulate in distribution pipes. Manganese may also be present in old iron mains due to corrosion.

In 2014, a total of 1,896 samples were tested for manganese: three (0.16%) contravened the regulatory standard of 50µg/l. This is an improvement on 2013 when 0.27% contravened the regulatory standard. NI Water reported that the cause for one of these contraventions was most likely related to a disturbance of mains deposits following unauthorised hydrant use. No cause was determined for other two contraventions.

Turbidity

Turbidity measurements provide an assessment of fine particles suspended in water. This parameter is often, but not always, associated with discolouration, which in turn can be caused by corrosion within the distribution system. Excessive turbidity can make the appearance of the water unacceptable to consumers.

Of the 1,896 samples taken in 2014, three (0.16%) failed to meet the turbidity standard of 4 NTU for consumers' taps, an improvement on 2013 (0.21%). NI Water reported that the cause for one of these contraventions was most likely related to a disturbance of mains deposits following unauthorised hydrant use. No cause was determined for the other two contraventions.

Other Pesticides

Of the 7,888 determinations, ten (0.13%) contravened the regulatory standard of 0.1µg/l for two individual pesticides: MCPA (5) and Clopyralid (5). These occurred in the water being supplied from Camlough, Clay Lake, Dorisland, Dungonnell, Killyhevlin, and Lough Fea WTWs. More details on these pesticide contraventions can be found in Part 2 of this report.

Microbiological Quality

To protect public health, microbiological standards have to be met at consumers' taps. The significance of the individual test results for each microbiological parameter cannot be fully interpreted without information being assessed from other monitoring data and the investigation related to the contravention. Samplers used by NI Water to collect samples from consumers' taps are trained and accredited to ISO 17025 and DWTS (Drinking Water Testing Standard).

Results confirm the general safety of drinking water supplies, with a high level of microbiological quality compliance (99.73 %) being achieved in 2014 as is shown in Table 5.2. This is an improvement in compliance from the 99.55% reported in 2013.

The Inspectorate issued a Completion of Undertakings Letter on 14 November 2014 for the Consideration of Provisional Enforcement Order (CPEO) regarding microbiological contraventions specifically within the Dunore Point WTWs distribution area which was issued in November 2013 (Refer to Annex 6 for more details).

Coliform Bacteria

In 2014 there has been an improvement in compliance with the coliform bacteria standard at consumers' taps. The level of compliance has improved from 99.04% in 2013 to 99.46% in 2014. Of the 28 occasions coliform bacteria were detected in 2014, *E. coli* was also detected on one occasion (see following section on *E. coli*).

NI Water advises the consumer where the contravention has been attributed to the domestic plumbing and what action, if any, they may need to take.

Table 5.2: Microbiological Quality at Consumers' Taps

Parameter	Number of Tests	Number of Tests not Meeting the Standards	% of Tests Meeting the Standards in 2014	% of Tests Meeting the Standards in 2013
Coliform bacteria	5,220	28	99.46	99.04
Clostridium perfringens	2,261	6	99.73	99.91
E. coli	5,220	1	99.98	99.87
Enterococci	392	0	100	100
Total	**13,093**	**35**		
% Compliance			**99.73**	**99.55**

Clostridium perfringens, E. coli and Enterococci

The presence of bacterium such as, *Clostridium perfringens*, *E. coli* and Enterococci is indicative of faecal contamination and they should not be found in any drinking water sample.

Clostridium perfringens were found in six (0.27%) of the 2,261 samples tested for this parameter in 2014. This marks a decline in compliance compared to 2013 when *clostridium perfringens* were found in two (0.09%) of samples. However, NI Water's investigations were unable to identify reasons for these contraventions. The water treatment works involved all appeared to be operating normally at the time and all follow-up samples at the WTWs and in distribution were satisfactory.

A total of 5,220 samples were tested for the presence of *E. coli* and one (0.02%) tested positive. The cause of this contravention was investigated by NI Water and found to be most likely due to contamination from the tap at the time of sampling. An inspection of the sample tap revealed that, although the tap appeared outwardly to be hygienic, there was potential contamination from within the tap.

The level of *E. coli* compliance in 2014 (99.98%) has improved from 2013 (99.87%). (Table 5.2 refers).

Enterococci were not detected in any of the 392 samples taken at consumers' taps by NI Water in 2014.

NI Water Consumer Contacts

Each year, NI Water provides us with information on the complaints and concerns of its customers. This enables us to make an assessment of consumer confidence in the quality of drinking water they receive. The total number of consumer contacts reported in 2014 was 6,331 compared to 7,087 in 2013, a decrease of 10.7% (Table 5.3 refers).

This figure is more in line with the number of consumer contacts reported prior to 2013.

As with previous years, the highest percentage of contacts and concerns continues to relate to the appearance of drinking water, with 68.8% of the contacts in 2014 related to appearance (Figure 5.5 refers).

Figure 5.5: Consumer Contacts and Concerns Received by NI Water in 2014

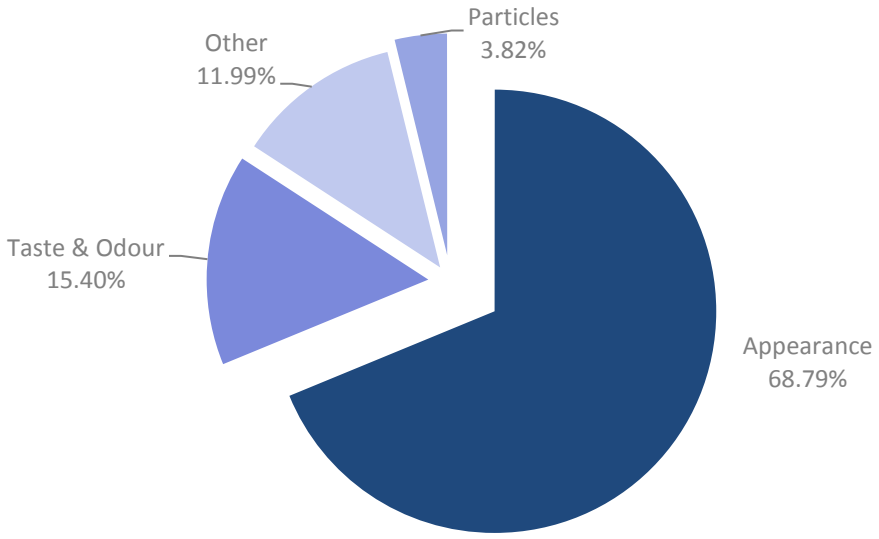


Table 5.3: Water Quality Contacts received by NI Water in 2014

Contact Category	Contact Sub-Category	Number of Contacts
Appearance	Colour	2,744
	General	181
	Hardness	0
	Stained Washing	0
	White - Air	985
	White - Chalk	445
Taste and Odour	Chlorinous	412
	Earthy/Musty	118
	Other (including Petrol/Diesel)	407
	TCP	38
Illness		0
Particles		242
Animalcules		0
Boil Water Notice		0
Other	Water Quality Concern - Campaigns	0
	Water Quality Concern - Incident Related - General	19
	Water Quality Concern - Lifestyle	8
	Water Quality Concern - Pets/Animals	0
	Water Quality Concern - Sample	442
	Water Quality Concern - Lead	202
	Water Quality (No Concern) Fluoride	0
	Water Quality (No Concern) Other Info	19
	Water Quality (No Concern) Water Hardness	51
	Water Quality (No Concern) Water Quality Report	18
	Copper Corrosion	0
TOTAL		**6,331**

Appearance

Within the overall appearance categories we look closer at the different sub-categories and the reasons for the contact from consumers.

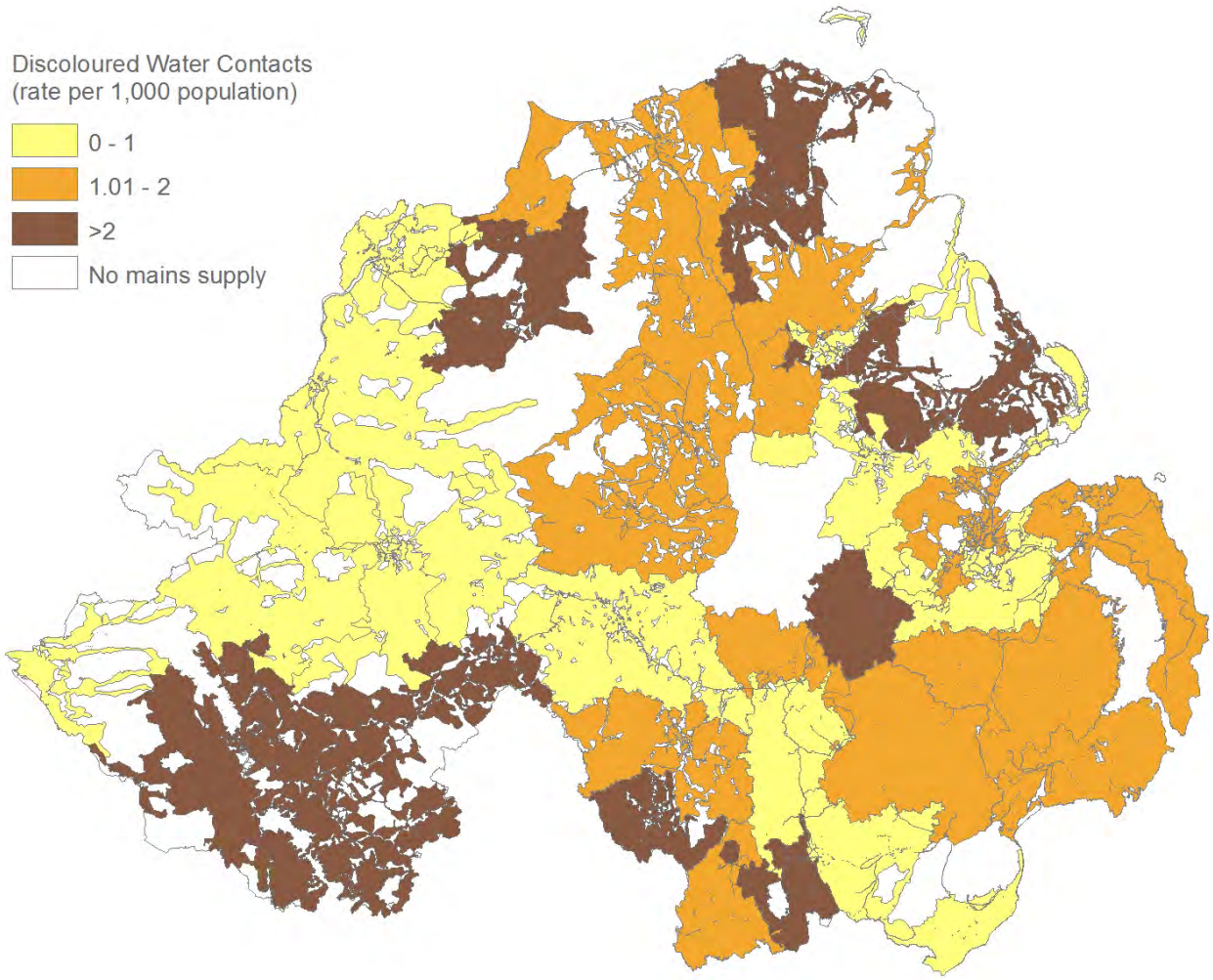
Colour

Within the appearance category, the main concern relates to discoloured water. The most common cause of coloured water concerns is an orange, brown or black discoloration caused by suspended particles of iron (orange/brown) and manganese (black).

Iron discoloration may occur through natural iron present in the raw water passing through inadequate treatment, or from corrosion of cast-iron distribution mains. Manganese is present in some raw waters and may not be removed if treatment is inadequate. It is expected that the ongoing mains rehabilitation programme will improve the appearance of the water being provided to consumers.

Figure 5.6 graphically illustrates the rate of consumer contacts reporting discoloured water throughout Northern Ireland for 2014.

Figure 5.6: Consumer Contacts per 1,000 Population Reporting Discoloured Water in 2014



White Water - Air

Another appearance concern is 'white water'. This is caused by air dissolved in the water, making it appear cloudy or milky white. A number of possible causes include burst mains, malfunctioning pumps, and consumer stop taps. Where air is the cause of white water, the cloudy appearance will clear in a glass of water from the bottom up.

White Water - Chalk

Chalk has a white powdery appearance and is made up of natural minerals found in water which form what is known as 'hardness'. A glass of water containing chalk will take up to an hour to clear from the top downwards, leaving fine white sediment in the bottom of the glass.

Taste and Odour

All water sources contain naturally occurring minerals. Water also contains dissolved gases, such as oxygen and carbon dioxide, which give tap water a characteristic taste. There may be other substances present in the water which can also cause consumer complaints. One such substance, which is intentionally added to drinking water, is chlorine, which accounts for the highest number of taste and odour complaints reported by consumers' in Northern Ireland. Other taste and odours should not be present in drinking water for aesthetic reasons (TCP or earthy/musty) or health reasons (petrol/diesel). Forty-two per cent of the consumer concerns in 2014 fall under the sub-category 'other', which covers a range of complaints from grassy and fruity to rotten eggs.

Chlorinous

Some people are sensitive to the taste and odour of chlorine which is used to maintain hygienic conditions within the water supply network. Forty-two per cent of taste and odour consumer contacts in 2014 were related to a chlorinous taste and odour in the water. Advice on steps you can take to reduce the effect of chlorinous taste and odour on your water supply can be obtained from NI Water.

Petrol/Diesel

Spillages of petrol, diesel or heating oil can percolate through the soil and penetrate plastic water mains.

Earthy/Musty

Earthy and musty tastes can arise due to naturally occurring compounds present in raw waters that have not been removed by the treatment process.

TCP

Phenolic tastes can occur when chlorine reacts with components in household appliances or plumbing. Common sources of phenol include washing machine hoses, tap washers and kettles. WRAS approved plumbing products, which do not contain phenol, should be used in all plumbing installations.

Particles

The presence of visible particulate matter in water which is otherwise not discoloured can be caused by corrosion of iron mains or deposits of sand, grit or other material present in the main. These particles may be re-suspended following a change in the flow of the main.

Samples at Public Buildings

NI Water is required to randomly select addresses throughout Northern Ireland from which to take compliance samples and some of these locations will be public buildings. In 2014, 190 samples were identified by NI Water as being taken from taps within public buildings. Of these, three contravened the drinking water quality standards.

One contravened the standard for coliform bacteria. Investigations were unable to determine a cause for this contravention and all resamples were satisfactory.

One contravened the standard for iron. Investigations concluded that the cause of this contravention was due a disturbance of mains deposits.

One contravened the standard for lead. Investigations confirmed this contravention was due to a lead service pipe. NI Water replaced the section of lead piping for which they were responsible and notified the occupier, subsequent resamples were satisfactory.

Sampling and Analysis Frequencies

The Regulations set out sampling frequencies for a set list of parameters. NI Water is required to meet these sampling requirements in demonstrating the wholesomeness of drinking water supplies. We undertake an assessment of these regulatory requirements throughout the water supply chain: at water treatment works; at service reservoirs; and in water supply zones.

If a water supply zone has a standard annual sampling frequency for a parameter set below 50, we assess any shortfall in the sampling programme for that parameter as non-trivial. Where the annual sampling frequency is set for 50 samples or more, a shortfall of the regulatory sampling requirements of 2% of the total will be assessed as non-trivial.

During 2014, out of the 51,151 determinations carried out on samples taken from consumers' taps, we identified a non-trivial shortfall of five determinations from one water supply zone. This deficiency in the requirements was for the five parameters: 1,2 Dichloroethane, Benzene, Tetrachloroethene/Trichloroethene - Sum, Tetrachloromethane, and Total Trihalomethanes (THMs). NI Water did not meet its sampling requirements in relation to these parameters as samplers were unable to access Rathlin Island during poor weather conditions.

Risk Management

The overall risk assessment approach adopted by NI Water is to protect its drinking water supplies by identifying any potential risks of contamination and having appropriate control measures in place, to best ensure that water is safe and clean to be used by consumers. As part of this assessment, NI Water are required to undertake a risk assessment of potential issues within the distribution system and this includes general risks which may be identified within properties.

Some of these control measures are the responsibility of NI Water whereas others such as internal plumbing at domestic households are the responsibility of the owner.

Where there is a potential risk to the drinking water supplies from internal pipe work within domestic, industrial or other properties, NI Water are required to advise the owner what steps the property owner can take to safeguard their supply of drinking water, and, where required, to protect public health.

To prevent potential contamination, the Water Fittings Regulations require that all plumbing systems, water fittings and equipment connected to the public water supply are of an appropriate quality and are installed correctly. The Water Fittings Regulations apply from the point where water leaves the water main and enters the property's service pipe.

Owners and occupiers of premises and anyone who installs plumbing systems or water fittings must comply with these Regulations. More information on the Water Fittings Regulations is available from NI Water's website: www.niwater.com/water-fittings-regulations

Further Sources of Information for consumers

If you want to find out about the quality of drinking water supplied to your home or workplace, or if you have a drinking water quality concern or complaint, then you should first contact NI Water at its Customer Service Unit on 03457 440088 (further details can be found in Annex 9).

If you have discussed your concerns with NI Water and feel that the issue has not been satisfactorily resolved, you may contact the Consumer Council for Northern Ireland on 0800 1216022 (see Annex 9 for further details).

For advice on how to maintain the quality of tap water in your home, a guide called 'Looking after WATER in your home' is available from NI Water's website: www.niwater.com/information-leaflets.

Looking for a plumber - WaterSafe is the new online search facility and assurance scheme for sourcing a qualified plumber (see Annex 8 for more details).

NI Water's website includes a section on water hardness and water quality. To find out the water hardness in your area follow the link www.niwater.com/water-quality-results/ and enter your postcode. The water hardness results and a link to the latest public register will be displayed for the water supply zone in question.

Section 2
Private Water Supplies

Image: *Borehole - NIEA*

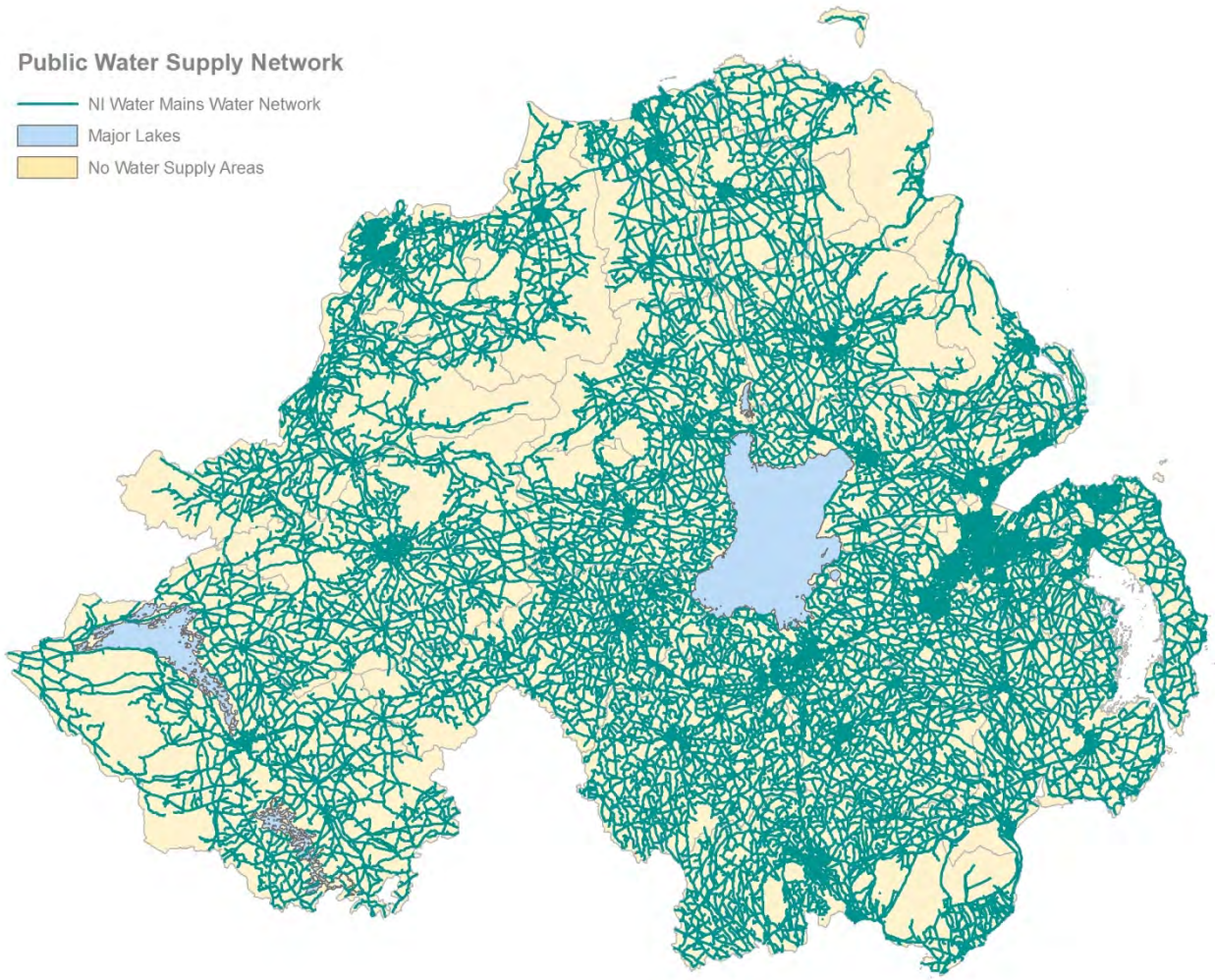
Section 2
Private Drinking Water Supplies

- 134 registered private water supplies in 2014, including 12 new supplies
- 87% are commercial / public supplies; and 13% are small domestic supplies
- All of the supplies are from groundwater sources
- Of the 10,245 samples taken, 98.90% complied with the regulatory standards
- Full compliance was achieved at 63% of registered private water supply sites

NI Water supplies water to over 99% of the Northern Ireland population; the remainder is served by private water supplies. The extent of the NI Water mains network is shown in Figure 1.1. The areas of no water supply are those where domestic properties are most likely to be served by a private water supply.

Consumers often assume the water they are drinking is the public water supply. However, although the number of people directly served by a private supply may be small, many more people are exposed to them through their use in both commercial activities and public buildings.

Figure 1.1: NI Water Mains Network (and no water supply areas)



Private water supplies are often used as an alternative to or in conjunction with the public water supply for a range of activities (see Figure 1.2):

- holiday accommodation such as hotels or bed & breakfast facilities;
- public buildings such as hospitals, care homes or universities; and
- food processors i.e. in the manufacture of food and drink products.

Register of Supplies

There were a total of 134 supplies on our register in 2014. A review of the extent of the NI Water mains network, undertaken by the Department of Regional Development (DRD) in 2010, identified properties potentially not connected to the public water supply. Based on this, it is estimated that there are approximately a further 1,200 private supplies to single private dwellings. These single private dwellings are not required to be monitored under The Private Water Supplies Regulations (Northern Ireland) 2009. The Environmental Health departments of local councils may test these supplies on request. The quality of water required within primary production (including dairy farms) is under consideration by the Food Standards Agency.

The information held on registered supplies is required to be kept up-to-date and reviewed on an annual basis. During 2014, the private water supplies sampling programme required adjustment where: the nature or purpose of supplies changed; sites switched to the public water supply; or when new supplies were notified to us.

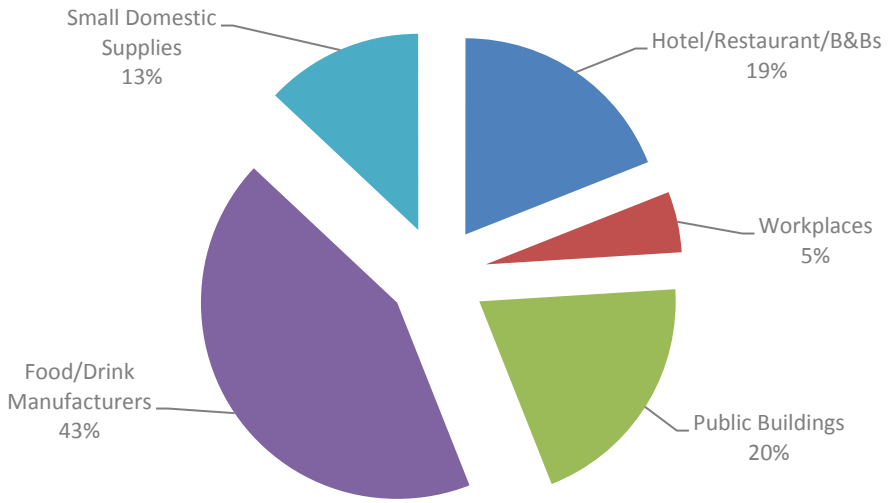
The larger commercial / public premises using private water supplies tend to be located in urban areas or in rural locations where access to the public water supply is also available. Many of these sites maintain a connection to the public water supply as a contingency or operate a dual supply whereby the public water supply is used for certain activities at the site or blended with the private water supply to supplement it. Private water supplies to small domestic properties are usually situated in the more remote, rural parts of Northern Ireland where access to the public water supply is not a feasible option.

Private water supplies may be drawn from either surface or groundwater sources. Surface sources can include streams, rivers and reservoirs; groundwater sources include wells, boreholes and springs. Presently, all registered private supplies in Northern Ireland are from groundwater sources, most commonly, boreholes.

Monitoring of Supplies

An annual sampling programme is in place for each registered private supply. The frequency of the sampling and the range of parameters tested for are determined by the type of the supply and the volume of water used or population served.

Figure 1.2: Categories of Private Water Supplies in Northern Ireland in 2014



Of the 134 private water supplies on our monitoring schedule for 2014, 87% are commercial/public supplies; and 13% are small domestic supplies (groupings of two or more houses). A breakdown of the numbers and sizes of private water supplies in 2014 is shown in Table 1.1.

During 2014, six sites were removed from the sampling programme as they no longer met the necessary criteria to be registered. In addition, a total of 12 new supplies registered with us, these included:

- one educational/research facility;
- one hotel/catering facility;
- five food/drink manufacturers;
- three sites used as B&B/holiday homes;
- one workplace providing drinking water to customers & staff; and
- one small domestic supply serving two or more properties.

Although the sampling frequency for compliance sampling is set within the 2009 Regulations, many additional samples are lifted throughout the year during follow-up investigations. In addition, where necessary, sites can be put on an increased sampling frequency for a set period of time to monitor any parameters identified as a risk in the supply. During 2014, a total of 82 ancillary samples were collected. These samples are not included in the calculation of the overall compliance for private water supplies.

A breakdown of registered private water supplies in Northern Ireland in 2014, categorised by size, is shown in Figure 1.3. All district councils, with the exception of Carrickfergus, and North Down, had private water supplies included in our 2014 sampling programme.

Risk Assessment

The regulations require a risk assessment to be carried out for each supply, within six months of registration, to identify areas where there may be potential risks to the water quality. This assessment includes the whole private water supply system, from source to the point where the water is used. These assessments follow the same principles used in the risk assessments in place for the public water supply.

A new tool developed for the risk assessment of private water supplies is being introduced. Figure 1.4 highlights the main areas inspected when completing a private water supply risk assessment. A number of hazards are considered for each aspect of the water supply system: catchment, source, treatment and distribution. The likelihood of the hazard occurring is determined to provide a risk rating and the controls in place to minimise the identified risks are incorporated.

A total of ten risk assessments were undertaken in 2014 for newly registered supplies. The information gathered through this process is used to determine any actions needed to reduce or mitigate against the risks identified. The risk assessment is required to be updated where there have been significant changes made to the supply or potential new risks identified. There is also a five year review required to be carried out on all risk assessments.

The risk assessments have also been used to adjust the monitoring programme at private supplies. In 2014 where the risk assessment and previous results indicated that specific parameters were unlikely to be present, and were of low risk,

Table 1.1: Numbers and Types of Private Water Supplies in 2014

Types of Private Water Supplies - Volume (m^3/day)	Number of Supplies	Frequency of Sampling (per annum)
(i) Commercial/Public Supplies		
>1000 ≤2000	2	10
>100 ≤1000	18	4
>10 ≤100	50	2
≤10	47	1
(ii) Small Domestic Supplies (two or more dwellings)		
≤10	17	1
TOTAL	**134**	

Figure 1.3: Distribution of Registered Private Water Supplies by Council Area in 2014

Number of private water supplies in each council area. Due to the scale of the map all sites are not distinguishable.

monitoring for these parameters was removed or reduced. Equally, where a risk was identified additional monitoring was undertaken to quantify the risk.

We reduced the number of pesticides we tested for in the 2014 monitoring programme. This was based on a review of the historical monitoring data from both our sampling; Water Framework Directive Monitoring; results for the public water supply (NI Water); and pesticide usage data from the Department of Agriculture and Rural Development (DARD).

Overall Drinking Water Quality

We have been monitoring the quality of private water supplies since 1999, and 2014 provides the fifth year of monitoring data under the 2009 Regulations. These regulations apply equivalent drinking water quality standards to private water supplies as to the public water supply. There were an increased number of private water supplies registered with us in 2014 than in previous years. However, a review of the sampling programme, carried out at the end of 2013, meant there was an overall decrease in the number of parameters analysed for at each supply in 2014.

The results in Table 1.2 show that, out of a total of 10,245 tests carried out in 2014, 98.90% met the regulatory standards. The regulatory requirements were not met on 113 occasions for 19 parameters, namely: coliform bacteria; hydrogen ion; iron; manganese; Enterococci; *E.coli;* ammonium; turbidity; *Clostridium perfringens*; trihalomethanes; total pesticides; aluminium; individual pesticides (Glyphosate, Mecoprop); sodium; sulphate; bromate; chloride; and lead.

Figure 1.4: Risk Assessment of Private Water Supplies

Catchment

- Land use in the vicinity of the source;
- Geology of the catchment area;
- Potential sources of microbiological contamination such as presence of livestock, spreading or storage of slurry or manure;
- Potential sources of chemical contamination such as application of fertilisers or pesticides.

Source

- Nature of source – borehole, well, spring, stream, river or reservoir;
- Protection of source e.g. from livestock or vandalism;
- Construction of source designed to prevent surface water ingress;
- Diversion of microbiological and chemical contamination risks away from water source.

Treatment

- Treatment suitable for nature and quality of raw water source;
- Appropriate form of disinfection in place where required;
- Adequate controls in place for ongoing management of treatment system;
- Procedures and records for regular maintenance of treatment.

Distribution

- Schematic plan of distribution network for water supply including any off-takes or storage tanks;
- Inappropriate cross connections to outhouses or animal drinkers;
- Regular cleaning of pipe work and storage tanks and suitable turnover of water in system;
- Potential for damage to exposed pipes (vermin, sunlight, freezing) or contamination from oil storage near plastic pipes.

Table 1.2: Overall Water Quality in Private Water Supplies in 2014

Parameters	Determinations in 2014		
	Total Number of Tests	Number of Tests not Meeting the Standards	% Compliance
Coliform bacteria	255	22	91.37
E. coli	255	12	95.29
Enterococci	152	7	95.39
Clostridium perfringens	238	3	98.74
Microbiological Total	**900**	**44 (4.89%)**	**95.11**
Hydrogen ion (pH)	254	17	93.31
Iron	238	15	93.70
Manganese	238	14	94.12
Ammonium	238	4	98.32
Turbidity	254	4	98.43
Trihalomethanes	114	1	99.12
Total pesticides	120	1	99.17
Aluminium	238	1	99.58
Individual pesticides	5955	3	99.95
Colour	238	0	100.00
Nitrite	238	0	100.00
Nitrate	238	0	100.00
Other parameters	806	0	100.00
Sodium*	38	4	89.47
Sulphate*	12	1	91.67
Bromate*	29	2	93.10
Chloride*	34	1	97.06
Lead*	63	1	98.41
Chemical Total	**9345**	**69 (0.74%)**	**99.26**
Overall Total	**10245**	**113 (1.10%)**	**98.90**

**Parameters on reduced monitoring frequency*

The low compliance figures for sulphate, bromate, sodium, and chloride, are a consequence of the low number of tests performed for these parameters as they were not routinely tested for in all supplies. Apart from newly registered supplies: bromate was only tested at sites where chlorination was in use; sodium was only included where softening was practised; chloride and sulphate were only included where a supply had a history of contraventions for these parameters; and lead was only tested at sites where a potential risk was identified.

Full compliance was achieved for 63% (84 sites) of the private water supplies tested. Of the 37% (50 sites) which did not comply with the regulatory standards:

- 30 use the private water supply as the primary source of drinking water;
- 12 use the water for the washing of equipment and surfaces in contact with food or drink;
- seven use the supply as an ingredient in food or drink; and
- one is used solely for personal hygiene (showers, wash hand basins).

These contraventions are investigated and addressed through: restrictions on the use of the

supply; the implementation of corrective action such as improvements to source protection; installation of, or upgrade to treatment systems; and improved maintenance programmes.

A comparison of the monitoring data since the introduction of the regulations in 2010 shows a variability in compliance (Figure 1.5 refers). No trends can be taken from these figures as they are not comparing like with like due to changes in the number and types of supplies and the year-on-year revisions to the sampling programme. In particular, the number of compliance tests in 2014 and 2013 was substantially greater at 10,245 and 10,669 respectively compared with only 6,121 in 2012; 7,867 in 2011; and 7,411 in 2010. This is contributed to by the increased number of pesticides tested for in private water supplies in both 2013 and 2014.

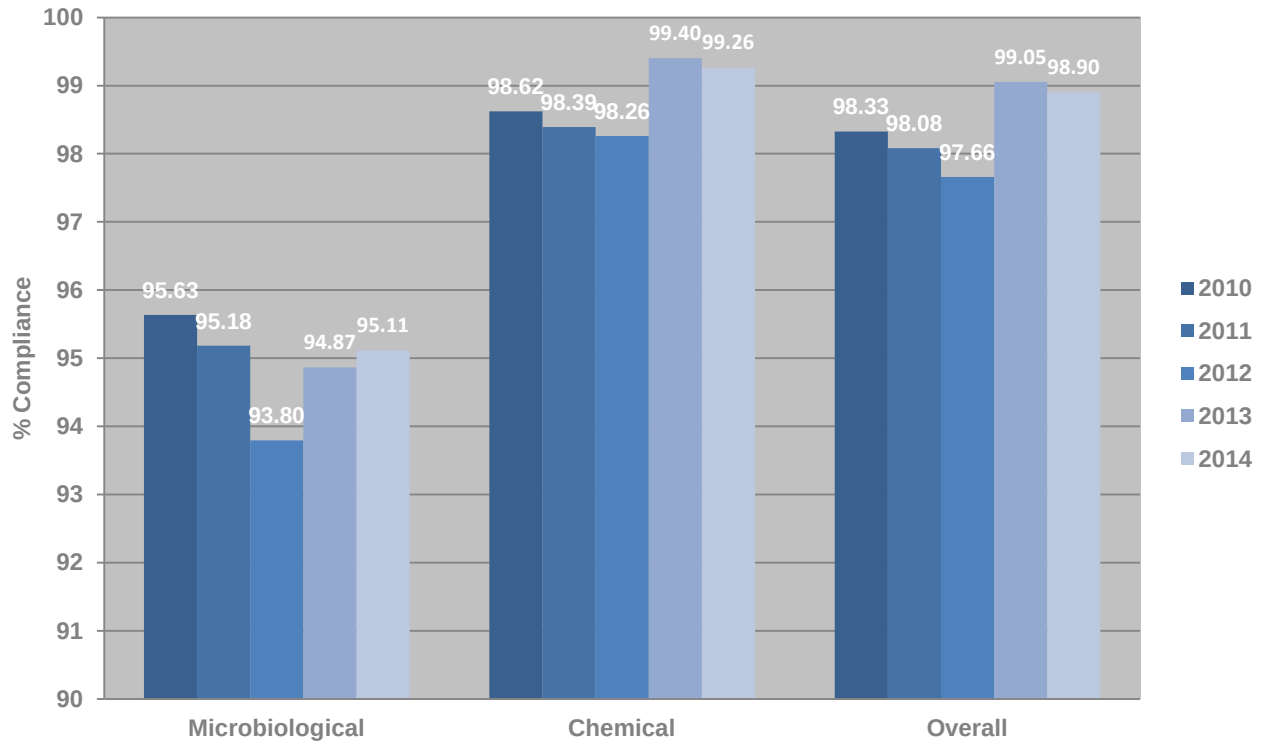
For microbiological results, the number of tests undertaken, although small, has increased steadily over recent years, with 733 in 2010; 768 in 2011; 822 in 2012; 818 in 2013; and 900 in 2014. This is due to the steady increase in numbers of private water supplies being registered with us. Though there has been an increase in the level of microbiological compliance in 2014 with 95.11% reported, compared to 94.87% in 2013, this is not considered to be significant.

Microbiological contraventions account for 44 (38.94%) of the 113 contraventions at private water supplies in 2014. These contraventions occurred at 26 out of 134 sites and continue to be a concern with 10 (38%) supplying domestic properties and 16 (62%) serving commercial or public premises. Priority was given to advancing improvements to the water quality through:

- provision of advice and guidance;
- agreeing action plans (particularly at the larger commercial/public sites); and
- promotion of water safety plans for the ongoing management of these supplies.

Contraventions of the chemical standards have been reported for a range of parameters listed in Table 1.2. Although there has been a slight decrease in chemical compliance in 2014 – 99.26% compared with 99.40% in 2013 (see Figure 1.5), this is, in part, due to the reduced number of chemical parameters tested for in 2014 compared with 2013.

Figure 1.5: Comparison of Compliance in Private Water Supplies, 2010 - 2014



Overall, the number of chemical contraventions has increased from 59 in 2013 to 69 in 2014. Food or drink manufacturing sites account for 18 out of the 32 sites showing chemical contraventions. As with previous years, where the standards have not been met, they relate mainly to contraventions for hydrogen ion, iron and manganese. A comparison of the levels of compliance for iron and manganese in private water supplies over the last five years is shown in Figure 1.6. The significant increase in compliance for these parameters, post-2012, is influenced by sites with a history of contraventions for iron and manganese no longer being used as a private water supply.

Factors Affecting Drinking Water Quality

The different elements within the water supply chain contribute to the 44 microbiological and 69 chemical contraventions reported in 2014 such as catchment (including source protection), treatment, distribution and sampling point (tap) issues.

Catchment

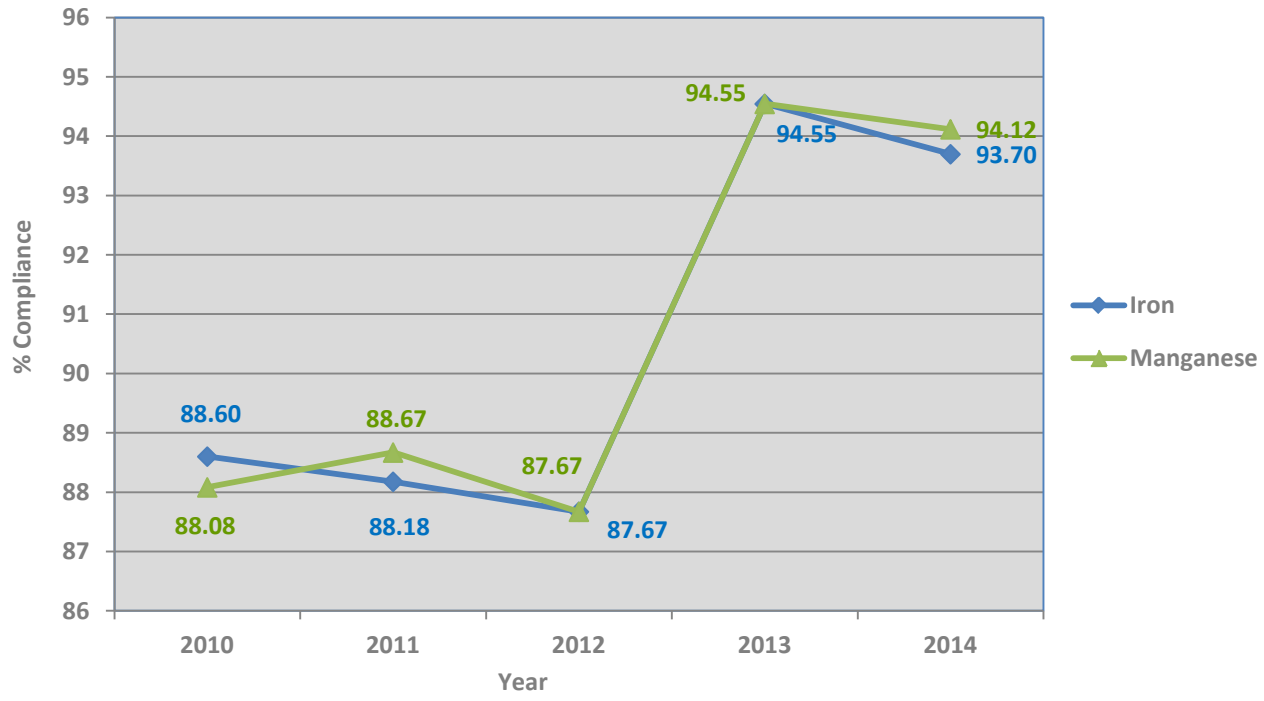
Inadequate source protection was identified as the cause of 80% of microbiological contraventions at private water supplies in 2014. From a total of 134 supplies monitored during 2014, 26 sites failed to be microbiologically satisfactory: 17 (65%) of these were from untreated supplies mainly in rural areas with poor levels of source water protection.

Water supplies in the vicinity of farmland, where animals graze or manure is spread, are most at risk. This is particularly prevalent at times of heavy rainfall, when water may run directly off farmland and carry micro-organisms into unprotected private supplies. Guidance on source protection is available in the Private Water Supplies Technical Manual (see Annex 8 for details).

Microbiological contraventions were reported for five commercial sites with poor source protection. These were supplies to small business operators where no disinfection treatment was present. In these instances, adequate source protection is crucial, however, where there is a known risk of microbial contamination, the installation of appropriate disinfection treatment is recommended. Of the five sites: ultra-violet disinfection treatment was put in place at one; two sites switched to using an alternative supply of drinking water; and the remaining two sites reviewed their source protection measures.

There were three pesticide contraventions noted at two private supplies in 2014. These pesticide failures occurred for two borehole supplies where the water is used as drinking water. Trace levels of pesticides below the regulatory limit of 0.10µg/l for individual pesticides, and 0.03µg/l for heptachlor epoxide, were also detected at 24 other sites. A summary of the pesticide detections in 2014 is presented in Table 1.3; the individual pesticides which were non-compliant are highlighted in bold.

Figure 1.6: Compliance for Iron and Manganese at Private Water Supplies in 2010 - 2014



Pesticides should not be stored or sprayed within the vicinity of drinking water sources. Where pesticides are of concern, appropriate measures should be put in place to reduce the risk of them entering the water supply through good practice in the management of the catchment area and improved source protection.

DARD is responsible for the implementation of legislation on agricultural pesticides and plant protection products in Northern Ireland. The Plant Protection Products (Sustainable Use) Regulations (Northern Ireland) 2012 have a number of provisions aimed at ensuring the sustainable use of pesticides, by reducing risks and impacts on human health and the environment. These include measures on protecting water, and promotion of low pesticide usage regimes. A Code of Practice for using Plant Protection Products published by DARD provides practical advice on how to use pesticides and plant protection products safely and so meet the legal conditions which cover their use.

Some groundwaters can contain high levels of naturally occurring iron and manganese. Of the 29 contraventions reported for these metals in 2014, 25 were due to the quality of the source water. High levels of iron and manganese may affect the appearance, taste or smell of the water resulting in turbidity, colour, taste, and odour contraventions. Their presence at high levels can interfere with the disinfection process. There are effective treatments which can be installed to reduce the levels of these metals in private supplies. Five sites currently using these technologies failed to meet the standards for iron and/or manganese due to the treatment not being maintained or operated effectively. Further information on these treatment options is available in the Private Water Supplies Technical Manual (see Annex 8 for details).

A new Directive was published by the European Union in November 2013, Council Directive 2013/51/Euratom. This Directive, which is to be transposed into national legislation by November 2015, sets out new requirements for the monitoring of radioactive substances (including radon) in waters under the scope of the Drinking Water Directive. Work is ongoing to gather information on radon levels in private water supplies and develop radon risk maps for Northern Ireland in advance of the legislative changes to be introduced in 2015.

Treatment

During 2014, 16% of microbiological contraventions were due to a failure to appropriately maintain existing treatment systems. These contraventions highlight an ongoing area of concern for private supplies serving larger premises where treatment is not being operated correctly, routinely checked, or maintained. We continue to work with the owners/users of these supplies to put procedures in place to address these issues and encourage sites to develop ‘Water Safety Plans’ for the management of their water supplies.

We continued our monitoring programme during 2014 for disinfection by-products (DBPs) at 26 sites where chlorination is used as the means of primary disinfection of their water supply. Non-compliances were reported for the DBP, trihalomethanes, at one food manufacturing site, where the water is used for the washing of surfaces and equipment. This contravention was determined to be due to poor management of their chlorination process. An additional two food manufacturing sites reported non-compliances for bromate due to the inappropriate storage and use of poor quality hypochlorite.

Table 1.3: Pesticide Detections in Private Water Supplies in 2014

Pesticide	Number of Supplies	Maximum Value Detected (µg/l)
MCPA	8	0.094
Atrazine	6	0.050
Simazine	4	0.046
Glyphosate	**3**	**0.128**
MCPP	**3**	**3.385**
2,4-Dichlorophenol	2	0.016
Diuron	2	0.022
Asulam	1	0.018
Bentazone	1	0.028
Dicamba	1	0.014
Gamma Chlordane	1	0.024
Tri-allate	1	0.018

A total of ten sites using chlorine dioxide treatment were monitored for the DBPs, chlorite and chlorate. Five of these sites are food manufacturers where the water is used for the washing down of equipment and surfaces used in the manufacturing process. The other five sites are used as a supply to which the public has access: three healthcare facilities; and two educational institutions. The public supply sites were kept on increased sampling frequency. The information gathered through this increased monitoring is used to assess the risk associated with DBPs at these sites and determine what action may be required.

It is a requirement of the regulations that any product or substance introduced to a private water supply must be approved for use. A list of products approved for use in the public water supply is published. This list equally applies to private water supplies and provides national conditions of use for chlorine dioxide disinfection. It requires that the dosing of chlorine dioxide should be controlled so that the combined concentration of total oxidants does not exceed 0.5 mg/l. It is the responsibility of owners to demonstrate that the design, operation and maintenance of the disinfection process ensures that disinfection by-products are as low as possible without compromising its effectiveness for the disinfection of drinking water.

Distribution

A small number of iron contraventions, four out of 15 (27%), reported for private water supplies in 2014 were due to cast iron pipe work and/or storage tanks within the distribution system. High levels of iron in a water supply can cause aesthetic problems including a metallic taste and discoloration and staining of water fittings. It can also affect treatment systems, such as ultra-violet lamps, due to metal deposits causing a reduction in their effectiveness for disinfection. Sites are encouraged to clean out storage tanks and flush through pipe work or, where required, replace parts of their distribution network to reduce the levels of iron in their supplies.

The levels of lead detected in private water supplies in 2014 were in the range <1 – 117µg Pb/l. Only one site was identified as needing to take corrective actions to replace old lead pipe work in order to comply with the 10µg/l standard for lead. Another issue which can arise through lack of maintenance of distribution systems is raised levels of colony counts in supplies. This occurred at one of the 134 sites in 2014. Colony counts are useful in assessing the cleanliness and integrity of distribution systems. High levels of background bacterial growth can often lead to an increase in taste and odour complaints. Where this occurs, owners are advised to flush and disinfect their distribution network. Guidance on carrying this out is available in BS 8558:2011: Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. A document on ‘Water Safety in Buildings’, published by WHO, is also available and provides guidance for managing water supplies in buildings (see Annex 8 for details).

Sampling Point

The compliance sample point for private water supplies is post any treatment and should be representative of the water supply at the point of use. To prevent contamination being introduced when samples are being collected, Environmental Health staff use approved sampling procedures.

Samplers are trained to collect the samples required as part of the regulatory monitoring programme to help ensure the integrity of the sample is not compromised. Guidance on sampling of water supplies is available in the ‘Private Water Supplies Sampling Manual: A Field Guide’. In 2014, one out of 44 microbiological contraventions was attributed to unrepresentative sampling.

There were no contraventions reported in 2014 due to the use of inappropriate fixtures and fittings. It is however important to remember that only products and substances approved for use with drinking water supplies should be used. In addition, plumbing systems should be designed and installed to reduce the risk of contamination of water supplies through inappropriate cross connections or misuse of fittings. The Water Regulations Advisory Scheme web site provides guidance on this.

Reporting and Health Risks

All contraventions of the regulatory standards at private supplies are reported to the owners and users of the supplies through the relevant district council. We work closely with local Environmental Health departments in the investigation of contraventions to establish the cause and identify any remedial actions needed to restore a wholesome water supply.

Where the contravention has occurred at a private water supply used in primary food production, such as meat processing, or in a workplace as drinking water for staff, we also liaise with Veterinary Officers

from DARD, and Health and Safety Executive staff respectively.

Contraventions are investigated through site visits conducted by Environmental Health staff and the collection of follow up samples. Depending on the nature and significance of the contraventions, it may also be necessary for us to carry out a site inspection. The owners/users of the supply are provided with practical advice on source protection and treatment options and best practice for the management of their water supply to reduce the potential risks of contamination.

Any contraventions at private water supplies, where the water is used as an ingredient in food production or as drinking water, that are considered as a risk to health are reported to the Public Health Agency (PHA) for appropriate health advice. Where necessary, the regulations contain a provision to issue Notices which can be used to restrict or prohibit the use of a supply.

In 2014, 20 new contraventions were notified to PHA for advice: 17 microbiological (coliform bacteria, *E. coli*, Enterococci and *Clostridium perfringens*) and 3 chemical (turbidity, lead, and chlorite). As a consequence, restrictions in the use of the private water supply were put in place at 9 sites to protect public health. These restrictions included switching to, or blending with, the public water supply (where this was available), boil water before use notifications, and do not use instructions.

Following investigations of these contraventions corrective actions were successfully completed to clear 11 of the 20 contraventions and remove the restrictions in place at 6 sites. Two sites remain on a boil water notice and a third site continues to use the public water supply. We continue to work with the owners and users of private water supplies and Environmental Health staff to bring these supplies into compliance.

In August 2014, we published our Private Water Supplies Enforcement and Prosecution Policy. This details the general principles which will be followed in relation to enforcement and prosecution of a person or persons who are legally responsible for ensuring compliance with the private water supplies regulations and is available from our website.

Collaborative Working

The Rural Borewells Grant Scheme administered by DARD provided financial assistance, funded by DRD, towards the installation of a private borehole (and/or appropriate treatment) in isolated rural areas. This scheme enabled applicants to obtain a wholesome water supply where this was not currently available and where accessing the public water mains network was not technically or financially possible. This scheme was in operation from June 2012 to March 2015. We interacted with DARD, DRD, Geological Survey of Northern Ireland, and local consultants to provide technical advice to this scheme.

In December 2014 an information bulletin was published and distributed to the owners and users of registered private water supplies. This bulletin, entitled ‘What’s new in private water supplies?’, provided updates on the publication of our Enforcement Policy for private water supplies; upcoming guidance on the use of private water supplies at primary food production sites and the new requirements to be introduced for radioactive substances in water intended for human consumption.

Work has been ongoing with the University of Ulster to provide Environmental Health students with research projects relating to private water supplies. The aim of this collaborative working is to help develop their understanding and knowledge of this area of public health. During 2014 we also worked with a local Environmental Health student providing support for their Masters project looking at the risk of radon in private water supplies in Northern Ireland.

Acknowledgements

We acknowledge the ongoing co-operation and assistance of staff from the Environmental Health Departments of district councils in helping us meet the regulatory requirements for private water supplies.

We also recognize the Public Health Agency for the guidance and advice it continues to provide on the health significance when the water quality standards have been contravened at private water supplies.

Annexes

Annex 1
Glossary and Definition of Terms

Aesthetic	associated with the senses of taste, smell and sight.
Animalcule	a tiny or microscopic life form.
Catchment	the area of land that drains into a watercourse.
Clopyralid	(3,6-dichloropyridine-2-carboxylic acid): a pyridinecarboxylic acid herbicide used for controlling broad-leaved weeds such as docks and creeping thistle in grassland.
Clostridium perfringens	a spore-forming bacterium which is exceptionally resistant to unfavourable conditions in the water environment.
Coagulation	a process employed during drinking water treatment to assist in the removal of particulate matter.
Coliforms	a group of bacteria which may be faecal or environmental in origin.
Communication Pipe	the connection from the water main to the consumer property boundary (normally at the outside stop tap).
Compound	a compound consists of two or more elements in chemical combination.
Contravention	a breach of the regulatory requirement.
Cryptosporidium oocyst	a protozoan parasite.
Determination	an analysis for a specific parameter.
Drinking Water Standards	the prescribed concentrations or values listed in the Regulations.
Enterococci	a sub-group of faecal streptococci commonly found in the faeces of humans and warm-blooded animals.
Escherichia coli (E. coli)	a type of faecal coliform bacteria commonly found in the intestines of animals and humans. The presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination.
Event	a situation affecting, or threatening to affect, drinking water quality.
Faecal Coliforms	a sub-group of coliforms, almost exclusively faecal in origin.
Filtration	the separation of suspended particulate matter from a fluid.
Flocculation	a process where colloids come out of suspension in the form of floc or flakes.
Granular Activated Carbon (GAC)	an absorbent filtration media used to remove trace organic compounds from water.
Groundwater	water from aquifers or other underground sources.
Hydrogen ion (pH)	gives an indication of the degree of acidity of the water. A pH of 7 is neutral; values below 7 are acidic and above 7 are alkaline. A low pH water may result in pipe corrosion. This is corrected by adding alkali during water treatment.
Indicator Parameter	something that is measured to check that the control measures, such as water treatment, are working effectively.
Leaching	to lose, or cause to lose, soluble substances by the action of a percolating liquid.
Linuron	a herbicide mainly used to control grasses and other weeds amongst cereal crops and vegetables.

MCPA	(4-chloro-2-methylphenoxy) acetic acid: an aryloxyalkanoic acid herbicide used for controlling broad-leaved weeds in grass or cereal crops.
Mean Zonal Compliance (%)	a measure of compliance with drinking water standards. It is the average of the zonal percentage compliances of all water supply zones in a region.
Mecoprop (MCPP)	2-(4-chloro-2-methylphenoxy) propanoic acid: an aryloxyalkanoic acid herbicide used for controlling broad-leaved weeds in grass or cereal crops.
Microbiological	associated with the study of microbes.
m^3/d	cubic metres per day.
mg/l	milligrams per litre (one thousandth of a gram per litre).
Ml/d	megalitres per day (one Ml/d is equivalent to 1,000 m^3/d or 220,000 gallon/d).
µg/l	micrograms per litre (one millionth of a gram per litre).
Oocyst	the resistant form in which *Cryptosporidium* occurs in the environment, and which is capable of causing infection.
Parameters	the substances, organisms and properties listed in Schedules 1 and 2, and regulation 2 of the Regulations.
Pathogen	an organism which causes disease.
Pesticides	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.
Plumbosolvency	the tendency for lead to dissolve in water.
Prescribed Concentration or Value (PCV)	the numerical value assigned to drinking water standards, defining the maximal or minimal legal concentration or value of a parameter.
Raw Water	water prior to receiving treatment abstracted for the purpose of drinking water provision.
Remedial Action	action taken to improve a situation.
Sedimentation	the tendency for particles in suspension to settle out of the water under the influence of gravity.
Service Pipe	pipe that connects the consumer's property to NI Water's main. It comprises two parts: the communication pipe which is the connection from the water main to the consumer's property boundary (normally at the outside stop tap); and the supply pipe which runs from the boundary of the property to the consumer's inside stop tap.
Service Reservoir	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
Supply Point	a point, other than a consumer's tap, authorised for the taking of samples for compliance with the Regulations.
Surface Water	untreated water from rivers, impounding reservoirs or other surface water sources.
Trihalomethanes (THMs)	a group of organic substances comprising, for the purposes of the Regulations, four substances: trichloromethane (also known as chloroform), tribromomethane (also known as bromoform), dibromochloromethane and bromodichloromethane.
Water Supply Zone	a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.
Wholesome/ Wholesomeness	a concept of water quality which is defined by reference to standards and other requirements set out in the Regulations.

Annex 2
The Regulatory Framework

In Northern Ireland, the primary legislative powers for transposition of the Council Directive (98/83/EC) ("the Drinking Water Directive") relating to the quality of water intended for human consumption are contained in The Water and Sewerage Services (Northern Ireland) Order 2006.

The Drinking Water Inspectorate is a statutory appointee, acting on behalf of the Department for Regional Development in respect of public water supplies, and on behalf of the Department of the Environment in relation to private water supplies. The Order confers enforcement powers on us in matters arising from both public and private water supplies.

Public Water Supplies

Northern Ireland Water Ltd (NI Water) began to operate as a government-owned company from 1 April 2007, and is the sole supplier of public drinking water in Northern Ireland. The Water Supply (Water Quality) Regulations (Northern Ireland) 2007 have been in operation since that date and implement the requirements of the Drinking Water Directive. They define wholesomeness by setting standards for 38 parameters and a further 12 indicator parameters; and they specify sampling requirements for samples taken at taps, within water supply zones, at service reservoirs and water treatment works.

Regulation 30 controls the application and introduction of products and substances. The Drinking Water Inspectorate for England and Wales provides a technical resource to facilitate this approval in the United Kingdom. The current "List of Approved Products for use in Public Water Supply in the United Kingdom" can be obtained from the Drinking Water Inspectorate for England and Wales.

The 2007 Regulations were amended by the Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2009, which came into operation on 15 July 2009 and included new requirements in relation to disinfection, risk assessment and monitoring of drinking water abstraction points. In addition to implementing the Drinking Water Directive (DWD), they implement parts of Council Directive 2000/60/EC ("the Water Framework Directive") and Council Directive 2008/99/EC ("the Environmental Crime Directive").

They were further amended by The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2010 which came into operation on 20 April 2010, and include clarification of the Department's responsibilities and powers of enforcement in respect of implementation of the Regulations.

The Water Supply (Domestic Distribution Systems) Regulations (Northern Ireland) 2010, which came into operation on 20 April 2010, require NI Water to report [to us] instances of water quality failures caused by the internal distribution system occurring within public buildings. It would then be our responsibility to assess the significance of these failures and, where required, ensure remedial action is undertaken by the person responsible for the building.

The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009 came into operation on 3 August 2009. These regulations make provisions for preventing contamination of drinking water by ensuring that all plumbing systems, water fittings and equipment connected to the public water supply are of an appropriate quality and standard. These regulations apply from the point where water leaves the water main and enters the property's service pipe. Owners and occupiers of premises and anyone who installs plumbing systems or water fittings must comply with these regulations.

Council Directive 2000/60/EC ("the EU Water Framework Directive (WFD)") came into force on 22 December 2000. Its aim is to protect all surface waters and ground waters and prevent any deterioration in quality. In the protection of drinking water sources, the WFD sets out a requirement to identify points for drinking water abstraction to be included in river basin management plans.

Private Water Supplies

Private water supplies are defined in The Water and Sewerage Services (Northern Ireland) Order 2006 as any supplies of water provided otherwise than by the water undertaker, namely NI Water.

The Private Water Supplies Regulations (Northern Ireland) 2009 came into operation on 18 January 2010 and implement Council Directive 98/83/EC on the quality of water intended for human consumption in relation to private water supplies.

They were amended by The Private Water Supplies (Amendment) Regulations (Northern Ireland) 2010, which came into operation on 20 April 2010 and provide clarification of some aspects of the 2009 Regulations, including the requirement to use only specified products or substances for private water supplies and to limit disinfection by-products to residual levels. They complete the transposition of Council Directive 98/83/EC.

Private supplies to single domestic dwellings are not required to be monitored under the 2009 Regulations. We do, however, continue to offer appropriate advice to all private water supply owners and users. The regulations also exclude bottled water suppliers, who are regulated under The Natural Mineral Water, Spring Water and Bottled Water Regulations (Northern Ireland) 2007.

Under Regulation 6 there is a requirement for any newly installed products or substances, used in the provision of a private supply, to be approved for use with drinking water. Details of approved products are available through the Drinking Water Inspectorate for England and Wales web site.

Annex 3
Drinking Water Quality Tables

The following tables provide more detail of where full compliance with the regulatory standards has not been met in the individual water supply zones. The tables present, by parameter, all the contraventions and the '% compliance' that occurred in water supply zones and at supply points at water treatment works during 2014. The map in Figure 3.1 shows the water supply zones from which samples are collected across Northern Ireland. These will, when used in conjunction with the information in the parameter tables that follow, allow the reader to have a more local focus on water quality issues.

Figure 3.1 Map showing Water Supply Zones across Northern Ireland in 2014

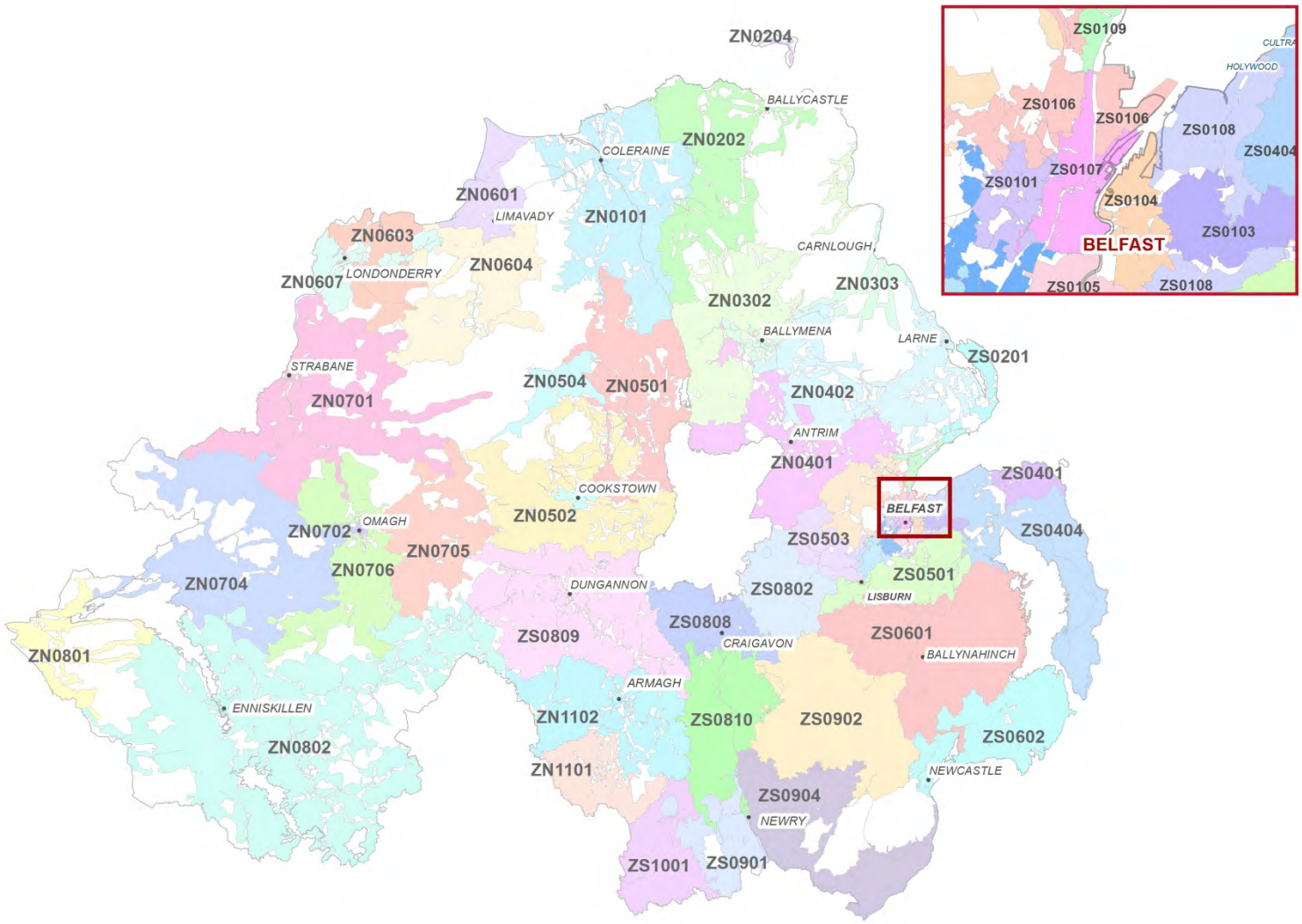


Table 3.1: Water Supply Zones within each Council in 2014

Council	Water Supply Zones	
Antrim	ZN0305 - Dungonnell Glarryford ZN0401 - Dunore Point Antrim ZN0402 - Killylane Ballynure	ZS0111 - Dunore Point Hydepark ZS0503 - Forked Bridge Stoneyford
Ards	ZS0401 - Drumaroad Bangor ZS0404 - Drumaroad Ards	ZS0501 - Drumaroad Lisburn ZS0601 - Drumaroad Ballynahinch
Armagh	ZN1101 - Clay Lake Keady ZN1102 - Seagahan Armagh ZS0808 - Castor Bay Craigavon	ZS0809 - Castor Bay Dungannon ZS0810 - Castor Bay Tandragee
Ballymena	ZN0302 - Dungonnell Glarryford ZN0303 - Dunore Point Ballymena ZN0305 - Dungonnell Ahoghill	ZN0401 - Dunore Point Antrim ZN0402 - Killylane Ballynure
Ballymoney	ZN0101 - Ballinrees Coleraine ZN0202 - Altnahinch Bushmills	ZN0302 - Dungonnell Glarryford
Banbridge	ZS0810 - Castor Bay Tandragee ZS0902 - Fofanny Dromore	ZS0904 - Fofanny Mourne
Belfast	ZS0101 - Dunore Ballygomartin North ZS0102 - Dunore Ballygomartin South ZS0103 - Belfast Ballyhanwood ZS0104 - Dunore Breda North ZS0105 - Dunore Breda South ZS0106 - Dunore Belfast North ZS0107 - Belfast Oldpark	ZS0108 - Belfast Purdysburn ZS0109 - Dorisland Whiteabbey ZS0111 - Dunore Point Hydepark ZS0404 - Drumaroad Ards ZS0501 - Forked Bridge Dunmurry ZS0503 - Forked Bridge Stoneyford
Carrickfergus	ZN0402 - Killylane Ballynure ZS0109 - Dorisland Whiteabbey	ZS0201 - Dorisland Carrick
Castlereagh	ZS0103 - Belfast Ballyhanwood ZS0104 - Dunore Breda North ZS0105 - Dunore Breda South	ZS0108 - Belfast Purdysburn ZS0404 - Drumaroad Ards ZS0501 - Drumaroad Lisburn
Coleraine	ZN0101 - Ballinrees Coleraine ZN0202 - Altnahinch Bushmills	ZN0501 - Moyola Magherafelt
Cookstown	ZN0501 - Moyola Magherafelt ZN0502 - Lough Fea Cookstown	ZN0504 - Moyola Unagh Mormeal
Craigavon	ZS0802 - Castor Bay Lurgan ZS0808 - Castor Bay Craigavon	ZS0810 - Castor Bay Tandragee ZS0902 - Fofanny Dromore
Derry	ZN0903 - Carmoney Eglinton ZN0604 - Caugh Hill Dungiven	ZN0607 - Corrody Derry
Down	ZS0601 - Drumaroad Ballynahinch ZS0602 - Drumaroad Downpatrick	ZS0902 - Fofanny Dromore
Dungannon & South Tyrone	ZN0502 - Lough Fea Cookstown ZN0706 - Lough Macrory Killyclogher ZN0802 - Killyhevlin Enniskillen	ZN1102 - Seagahan Armagh ZS0809 - Castor Bay Dungannon
Fermanagh	ZN0704 - Lough Bradan Drumquin ZN0801 - Belleek Garrison	ZN0802 - Killyhevlin Enniskillen
Larne	ZN0303 - Dunore Point Ballymena ZN0402 - Killylane Ballynure	ZS0201 - Dorisland Carrick
Limavady	ZN0601 - Ballinrees Limavady ZN0603 - Carmoney Eglinton	ZN0604 - Caugh Hill Dungiven ZN0607 - Corrody Derry
Lisburn	ZN0401 - Dunore Point Antrim ZS0111 - Dunore Point Hydepark ZS0501 - Drumaroad Lisburn ZS0502 - Forked Bridge Dunmurry	ZS0503 - Forked Bridge Stoneyford ZS0601 - Drumaroad Ballynahinch ZS0802 - Castor Bay Lurgan
Magherafelt	ZN0101 - Ballinrees Coleraine ZN0501 - Moyola Magherafelt	ZN0502 - Lough Fea Cookstown ZN0504 - Moyola Unagh Mormeal
Moyle	ZN0101 - Ballinrees Coleraine ZN0202 - Altnahinch Bushmills	ZN0204 - Rathlin Island ZN0302 - Dungonnell Glarryford
Newry & Mourne	ZN1101 - Clay Lake Keady ZS0810 - Castor Bay Tandragee ZS0901 - Camlough Newry West	ZS0902 - Fofanny Dromore ZS0904 - Fofanny Mourne ZS1001 - Carran Hill Crossmaglen
Newtownabbey	ZN0401 - Dunore Point Antrim ZN0402 - Killylane Ballynure ZS0106 - Dunore Belfast North	ZS0109 - Dorisland Whiteabbey ZS0111 - Dunore Point Hydepark
North Down	ZS0108 - Belfast Purdysburn ZS0401 - Drumaroad Bangor	ZS0404 - Drumaroad Ards
Omagh	ZN0701 - Derg Strabane ZN0702 - Glenhordial Omagh ZN0704 - Lough Bradan Drumquin	ZN0705 - Lough Macrory Beragh ZN0706 - Lough Macrory Killyclogher ZN0802 - Killyhevlin Enniskillen
Strabane	ZN0701 - Derg Strabane	ZN0704 - Lough Bradan Drumquin

Water Quality in Water Supply Zones in 2014

Table 3.2: % Compliance - Lead

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZS0104, Dunore Breda North	8	1	87.50
ZS0107, Belfast Oldpark	8	1	87.50
ZS0108, Belfast Purdysburn	8	3	62.50
ZS0109, Dorisland Whiteabbey	8	1	87.50
ZS0111, Dunore Point Hydepark	8	2	75.00
ZS0802, Castor Bay Lurgan	8	1	87.50
ZS0808, Castor Bay Craigavon	8	1	87.50
All other zones	336	0	100
Overall	**392**	**10**	**97.45**

Table 3.3: % Compliance - Iron

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0202, Altnahinch Bushmills	36	1	97.22
ZN0302, Dungonnell Glarryford	36	1	97.22
ZN0303, Dunore Point Ballymena	36	1	97.22
ZN0401, Dunore Point Antrim	52	1	98.08
ZN0402, Killylane Ballynure	52	1	98.08
ZN0502, Lough Fea Cookstown	24	1	95.83
ZN0504, Moyola Unagh Mormeal	24	2	91.67
ZN0601, Ballinrees Limavady	24	1	95.83
ZN0704, Lough Bradan Drumquin	24	1	95.83
ZN0802, Killyhevlin Enniskillen	52	1	98.08
ZS0404, Drumaroad Ards	76	1	98.68
ZS0601, Drumaroad Ballynahinch	52	1	98.08
ZS0602, Drumaroad Downpatrick	36	1	97.22
ZS0808, Castor Bay Craigavon	76	3	96.05
ZS0809, Castor Bay Dungannon	52	1	98.08
ZS0901, Camlough Newry West	24	1	95.83
ZS1001, Carran Hill Crossmaglen	24	1	95.83
All other zones	1,196	0	100
Overall	**1,896**	**20**	**98.95**

Table 3.4: % Compliance - Total Trihalomethanes

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0603, Carmoney Eglington	8	1	87.50
ZN0607, Corrody Derry	8	1	87.50
ZN0704, Lough Bradan Drumquin	8	2	75.00
All other zones	367	0	100
Overall	**391**	**4**	**98.98**

Table 3.5: % Compliance - Odour

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0603, Carmoney Eglinton	52	2	96.15
ZN0607, Corrody Derry	52	1	98.08
ZN0802, Killyhevlin Enniskillen	52	8	84.62
ZN1102, Seagahan Armagh	36	1	97.22
ZS0501, Drumaroad Lisburn	52	1	98.08
ZN1001, Carran Hill Crossmaglen	24	1	95.83
All other zones	1,628	0	100
Overall	**1,896**	**14**	**99.26**

Table 3.6: % Compliance - Coliform bacteria

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0101, Ballinrees Coleraine	228	2	99.12
ZN0303, Dunore Point Ballymena	96	2	97.92
ZN0401, Dunore Point Antrim	156	1	99.36
ZN0402, Killylane Ballynure	132	1	99.24
ZN1102, Seagahan Armagh Zone	96	2	97.92
ZS0103, Belfast Ballyhanwood	144	1	99.31
ZS0104, Dunore Breda North	108	2	98.15
ZS0105, Dunore Breda South	144	1	99.31
ZS0106, Dunore Belfast North	120	2	98.33
ZS0107, Belfast Oldpark	108	1	99.07
ZS0108, Belfast Purdysburn	108	1	99.07
ZS0401, Drumaroad Bangor	204	1	99.51
ZS0404, Drumaroad Ards	204	3	98.53
ZS0501, Drumaroad Lisburn	144	1	99.31
ZS0502, Forked Bridge Dunmurry	144	1	99.31
ZS0602, Drumaroad Downpatrick	108	1	99.07
ZS0808, Castor Bay Craigavon	204	2	99.02
ZS0809, Castor Bay Dungannon	156	1	99.36
ZS0810, Castor Bay Tandragee	120	1	99.17
ZS0902, Fofanny Dromore	96	1	98.96
All other zones	2,400	0	100
Overall	**5,220**	**28**	**99.46**

Table 3.7: % Compliance - Taste

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0603, Carmoney Eglinton	52	1	98.08
ZN0607, Corrody Derry	52	1	98.08
ZN0802, Killyhevlin Enniskillen	52	6	88.46
ZS0501, Drumaroad Lisburn	52	1	98.08
ZS1001, Carran Hill Crossmaglen	24	1	95.83
All other zones	1,664	0	100
Overall	**1,896**	**10**	**99.47**

Table 3.8: % Compliance - *Clostridium perfringens*

Sampling Location - Supply Points	Number of Samples	Number of Tests not Meeting the Standards per Supply Point	% Compliance
W1701P, Ballinrees WTWs	104	1	99.04
W2308P, Castor Bay WTWs	260	2	99.23
W2801, Fofanny WTWs	156	1	99.36
W3301P, Dunore Point WTWs	312	1	99.68
W3801, Drumaroad WTWs	365	1	99.73
All other supply points	1,064	0	100
Overall	**2,261**	**6**	**99.73**

Table 3.9: % Compliance - Aluminium

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0101, Ballinrees Coleraine	76	1	98.68
ZN0401, Dunore Point Antrim	52	1	98.08
ZN0601, Ballinrees Limavady	24	1	95.83
ZS0602, Drumaroad Downpatrick	36	1	97.22
All other zones	1,708	0	100
Overall	**1,896**	**4**	**99.79**

Table 3.10: % Compliance - Manganese

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0601, Ballinrees Limavady	24	1	95.83
ZN0607, Corrody Derry	52	1	98.08
ZS0602, Drumaroad Downpatrick	36	1	97.22
All other zones	1,784	0	100
Overall	**1,896**	**3**	**99.84**

Table 3.11: % Compliance - Turbidity

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0101, Ballinrees Coleraine	76	1	98.68
ZN0601, Ballinrees Limavady	24	1	95.83
ZN0802, Killyhevlin Enniskillen	52	1	98.08
All other zones	1,744	0	100
Overall	**1,896**	**3**	**99.84**

Table 3.12: % Compliance - Pesticides - Other Substances*

Sampling Location - Supply Points	Number of Samples	Number of Tests not Meeting the Standards per Supply Point	% Compliance
W1302, Lough Fea	272	1	99.63
W1303, Dungonnell	272	1	99.63
W2509, Clay Lake	272	1	99.63
W2706, Camlough	272	2	99.26
W3317, Dorisland	272	2	99.26
W4701, Killyhevlin	272	3	98.90
All other supply points	6,256	0	100
Overall	**7,888**	**10**	**99.87**

**All pesticides other than aldrin, dieldrin, heptachlor and heptachlor epoxide*

Table 3.13: % Compliance - *E. coli*

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0101, Ballinrees Coleraine	228	1	99.56
All other zones	4,992	0	100
Overall	**5,220**	**1**	**99.98**

Annex 4

Events

The tables below provide a list of all notified events in 2014. These are presented in the categories: major (Table 4.1); serious (Table 4.2); significant (Table 4.3); minor (Table 4.4); and not significant (Table 4.5).

Table 4.1: **Major** Drinking Water Quality Events in 2014

Date of Major Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Major Event	Associated Council Area(s)*
22 December 2014 - 22 January 2015	Many areas of Northern Ireland particularly western areas	Major impact on water supply and related water quality issues due to industrial action by some NI Water staff.	Armagh, Ballymena, Ballymoney, Banbridge, Cookstown, Craigavon, Derry, Dungannon & South Tyrone , Fermanagh, Limavady, Magherafelt, Newry & Mourne, Omagh and Strabane

**Associated Council Area at time of Event.*

Table 4.2: **Serious** Drinking Water Quality Events in 2014

Date of Serious Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Serious Event	Associated Council Area(s)*
21 - 22 May 2014	McVeigh's Well, Newtownabbey (1,000 properties)	A burst trunk main and the consequential loss of supply to downstream service reservoirs affected water quality and resulted in alternative supplies having to be deployed in North Belfast. There were over 100 related consumer contacts in the first four hours of the event and a significant number of appearance complaints.	Belfast and Newtownabbey

**Associated Council Area at time of Event.*

Table 4.3: **Significant** Drinking Water Quality Events in 2014

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)*
17 January 2014	Drumaroad WTWs (521,000 population)	Treatment difficulties led to elevated aluminium levels in the works final water and the related supply area.	Ards, Belfast, Castlereagh, Down, Lisburn and North Down
28 January 2014	Straid Road, Ahoghill (39 properties)	A contravention of the hydrogen ion (pH) standard occurred due to the presence of an asbestos cement-lined water mains. A Consideration of Provisional Enforcement Order (CPEO) was issued and NI Water replaced the relevant section of mains.	Ballymena
16 February 2014	Ballinrees WTWs (171,000 population)	Treatment difficulties led to aluminium and turbidity contraventions in the works final water.	Ballymoney, Coleraine, Limavady and Derry
3 May 2014	Killyhevlin WTWs (77,000 population)	Turbidity and manganese contraventions were reported as a result of recurring unrepresentative sampling due to sample line issues.	Dungannon & South Tyrone and Fermanagh
May - September 2014	Killyhevlin WTWs (77,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA contraventions in the works final water. A treatment upgrade is ongoing.	Dungannon & South Tyrone and Fermanagh
May - September 2014	Derg WTWs (39,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA contraventions in the works final water. A CPEO in relation to this issue was issued by the Inspectorate in early 2015.	Strabane
20 May 2014	Dungonnell WTWs (35,000 population)	Aluminium, iron and turbidity contraventions were reported as a result of operational activity.	Ballymena and Moyle
June - September 2014	Dorisland WTWs (131,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA contraventions in the works final water. The works has now been upgraded with specific treatment for pesticide reduction.	Belfast, Carrickfergus, Larne and Newtownabbey
11 June 2014	Ballyhagan Road, Maghera (12 properties)	Iron and turbidity contraventions occurred in samples taken in response to consumer complaints. Consumer concern regarding the quality of water being supplied resulted in a water quality complaint to the minister.	Magherafelt
16 June 2014	Altnahinch WTWs (31,000 population)	Operational work led to contraventions of the iron and turbidity standards in the works final water.	Ballymoney and Moyle

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)*
16 June - 25 July 2014	Quilly Road, Mullaghbawn (53 properties)	A "**Do Not Use Tap Water for Drinking or Cooking**" notice was issued following significant aluminium, manganese, iron and turbidity contraventions.	Newry & Mourne
23 June 2014	Killyhevlin WTWs (77,000 population)	Contraventions of the taste and odour standards occurred due to insufficient treatment for the removal of tastes and odours. A treatment upgrade is ongoing.	Dungannon & South Tyrone and Fermanagh
24 June - 26 September 2014	Camlough WTWs (26,000 population)	Contraventions of the individual pesticide standard for MCPA occurred due to insufficient pesticide removal treatment.	Newry & Mourne
July and August 2014	Lough Bradan WTWS (47,000 population)	Insufficient organics removal during the treatment process led to elevated trihalomethanes (THMs) in the works final water. Contraventions of the THMs standard occurred in Lough Bradan Water Supply Zone in July and August.	Omagh
5 - 8 August 2014	Dorisland WTWs (131,000 population)	An iron contravention occurred due to a filter backwash failure which impacted on the effectiveness of the treatment process.	Belfast, Carrickfergus, Larne and Newtownabbey
5 August 2014	Belleek WTWs (5,000 population)	A contravention of the individual pesticide standard for MCPA occurred due to insufficient pesticide removal treatment.	Fermanagh & South Tyrone
14 August - 1 October 2014	Lisnaree Road, Banbridge (2 properties)	Iron and turbidity contraventions occurred in a sample taken in response to a 'Dirty Water' complaint. Bottled water was provided until a short section of main was replaced.	Banbridge
19 August - 2 September 2014	Carmoney WTWs (51,000 population)	Contraventions of the THMs standard occurred due to inadequate organic removal during the treatment process.	Derry
1 September 2014	Altnahinch WTWs (31,000 population)	Treatment difficulties were caused by a problem with the lime dosing plant. The works failed to shut down automatically in response to the low final water pH.	Ballymoney and Moyle
10 September - 28 October 2014	Caugh Hill WTWs (74,000 population)	Contraventions of the standard for THMs occurred in Corrody Derry Water Supply Zone as a result of insufficient organics removal during the treatment process at Caugh Hill WTWs.	Derry and Limavady
22 September 2014	Caugh Hill WTWs (74,000 population)	A contravention of the hydrogen ion (pH) standard occurred following issues with the lime dosing plant which occurred after an electrical power failure.	Derry and Limavady

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)*
16 October 2014	Dorisland WTWs (131,000 population)	A contravention of the turbidity standard occurred following disturbances of the Clear Water Tank (CWT) related to urgent operational work.	Belfast, Carrickfergus, Larne and Newtownabbey
5 November 2014	Blackthorn Close, Kilcoo (100 population)	Consumer concern & local media interest due to chlorine taste & odour.	Down and Newry & Mourne
13 November 2014	Drumaroad WTWs (521,000 population)	An aluminium contravention occurred due to operational problems which adversely affected the treatment process.	Ards, Belfast, Castlereagh, Down, Lisburn and North Down
24 November 2014	Drumaroad WTWs (521,000 population)	A loss of disinfection occurred due to inadequacies in the disinfection regime and a lack of appropriate response to a low chlorine alarm. A Provisional Enforcement Order (PEO) was issued by the Inspectorate and remedial measures were completed by NI Water on 27 March 2015.	Ards, Belfast, Castlereagh, Down, Lisburn and North Down
25 November 2014	Dorisland WTWs (131,000 population)	A contravention of the iron standard occurred in the works final water following an electrical power surge which led to loss of effective treatment.	Belfast, Carrickfergus, Larne and Newtownabbey
1 December 2014	Killylane WTWs (52,000 population)	An aluminium contravention occurred in the works final water as a result of treatment difficulties during refurbishment work.	Ballymena, Carrickfergus, Larne and Newtownabbey
8 December 2014	Clay Lake WTWs (9,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred due to lack of adequate pesticide removal treatment.	Armagh
8 December 2014	Dungonnell WTWs (31,000)	A contravention of the individual pesticide standard for Clopyralid occurred in the works final water. There is no specific pesticide removal treatment at this works.	Ballymena and Moyle
8 December 2014	Killyhevlin WTWs (77,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred due to lack of adequate pesticide removal treatment.	Dungannon & South Tyrone and Fermanagh
8 December 2014	Dorisland WTWs (131,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred in the works final water. Work on the installation of specific pesticide removal treatment has completed in early 2015.	Belfast, Carrickfergus, Larne and Newtownabbey
9 December 2014	Lough Fea WTWs (44,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred in the works final water. There is no specific pesticide removal treatment at this works.	Cookstown, Dungannon & South Tyrone and Magherafelt

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)*
23 December 2014	Lough Macrory WTWs (35,000 population)	A turbidity contravention occurred in the works final water following a plant shutdown. The clear water tank was low and the normal operational response did not occur due to Industrial Action by some NI Water staff.	Omagh
30 December 2014	Lough Bradan WTWs (47,000 population)	A turbidity contravention occurred in the works final water following a plant shutdown. The clear water tank was low and the normal operational response did not occur due to Industrial Action by some NI Water staff.	Fermanagh & South Tyrone and Omagh

**Associated Council Area at time of Event.*

Table 4.4: Minor Drinking Water Quality Events in 2014

Date of Minor Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Minor Event	Associated Council Area(s)*
04 January 2014	Derg WTWs (39,000 population)	Primary disinfection was lost when the OSEC plant was damaged due to high winds. Disinfection was maintained at all times and there were no water quality contraventions.	Strabane
30 January 2014	Castor Bay WTWs (334,000 population)	No cause was determined for a contravention of the standard for *Clostridium perfringens.* All resamples were satisfactory.	Armagh, Banbridge, Craigavon, Dungannon & South Tyrone, Lisburn and Newry & Mourne
03 February 2014	Killyhevlin WTWs (77,000 population)	A turbidity contravention was reported as a result of unrepresentative sampling.	Dungannon & South Tyrone and Fermanagh
24 February 2014	Carran Hill WTWs (15,000 population)	An oil spill in Lough Ross had the potential to impact on the final water quality from Carran Hill WTWs but no oil entered the intake.	Newry & Mourne
20 March 2014	Lough Fea WTWs (44,000 population)	No cause was determined for a contravention of the coliform bacteria standard. All resamples were satisfactory.	Cookstown, Dungannon & South Tyrone and Magherafelt
16 April 2014	Fofanny WTWs (96,000 population)	No cause was determined for a contravention of the standard for *Clostridium perfringens.* All resamples were satisfactory.	Banbridge, Craigavon, Down and Newry & Mourne
24 April 2014	Ballinrees WTWs (171,000 population)	No cause was determined for a contravention of the standard for *Clostridium perfringens.* All resamples were satisfactory.	Ballymoney, Coleraine, Derry and Limavady
16 June - 4 July 2014	Pomeroy Road, Pomeroy (2 properties)	Bottled water was supplied to 2 properties following significant contraventions of the iron and turbidity standards in a consumer complaint sample.	Cookstown
29 June 2014	Drumaroad WTWs (521,000 population)	No cause was determined for a contravention of the standard for *Clostridium perfringens.* All resamples were satisfactory.	Ards, Belfast, Castlereagh, Down, Lisburn and North Down
05 August 2014	Glenhordial WTWs (34,000 population)	The works was shut down as a precautionary measure following ingress of flood water into the plant building. This prevented any impact on final water quality.	Dungannon & South Tyrone and Omagh
18 August 2014	Killylane WTWs (52,000 population)	No cause was determined for the detection of *Cryptosporidium* in the works final water. All resamples were satisfactory.	Ballymena, Carrickfergus, Larne and Newtownabbey

Date of Minor Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Minor Event	Associated Council Area(s)*
01 September 2014	Caugh Hill WTWs (74,000 population)	A contravention of the iron standard was reported due to unrepresentative sampling.	Derry and Limavady
05 September 2014	Carmoney WTWs (51,000 population)	An oil spill on the River Faughan had the potential to contaminate the raw water source for Carmoney WTWs. There was no impact on drinking water quality.	Derry
08 September 2014	Dunore Point WTWs (521,000 population)	No cause was determined for a contravention of the Enterococci standard. All resamples were satisfactory.	Antrim, Ards, Ballymena, Belfast, Castlereagh, Larne, Lisburn, Newtownabbey and North Down
07 October 2014	Rathlin WTWs (300 population)	No cause was determined for the detection of *Cryptosporidium* in the works final water. All resamples were satisfactory.	Moyle
20 October 2014	Castor Bay WTWs (334,000 population)	No cause was determined for a contravention of the standard for *Clostridium perfringens.* All resamples were satisfactory.	Armagh, Banbridge, Craigavon, Dungannon & South Tyrone, Lisburn and Newry & Mourne
13 October 2014	Lettershandoney (150 properties)	Consumer concern and media interest occurred when an asbestos cement main was burst by contractors during the installation of a new drainage pipeline.	Derry
04 December 2014	Seagahan WTWs (35,000 population)	No cause was determined for a contravention of the coliform bacteria standard. All resamples were satisfactory.	Armagh and Dungannon & South Tyrone
23 December 2014	Dunore Point WTWs (521,000 population)	No cause was determined for a contravention of *Clostridium perfringens* standard. All resamples were satisfactory.	Antrim, Ards, Ballymena, Belfast, Castlereagh, Larne, Lisburn, Newtownabbey and North Down

**Associated Council Area at time of Event.*

Table 4.5: Not Significant Drinking Water Quality Events in 2014

Date of Not Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Not Significant Event	Associated Council Area(s)*
14 January 2014	Killyhevlin WTWs (77,000 population)	A turbidity contravention was reported due to unrepresentative sampling.	Dungannon & South Tyrone, Fermanagh and Omagh
15 April 2014	Drumaroad WTWs (521,000 population)	A Hydrogen ion (pH) contravention was reported due to unrepresentative sampling.	Ards, Belfast, Castlereagh, Down, Lisburn and North Down
25 July 2014	Rehaghy SR (64,000 population)	Water was tankered into Rehaghy SR to maintain supplies during increased demand due to a burst main.	Armagh and Dungannon & South Tyrone
6 August 2014	Glen Road, Coalisland (1 property)	A '**Do Not Use Tap Water for Drinking or Cooking**' notice was issued to a single property following the detection of petrol odours.	Dungannon & South Tyrone
12 - 21 August 2014	Ashbrook Mews, Newry (2 properties)	Two contraventions of the odour standard occurred in adjacent properties following the relocation of a home heating oil tank.	Newry & Mourne
18 October 2014	Fofanny WTWs (97,000 population)	There was potential for contamination of Lough Island Reavy (a raw water source for Fofanny WTWs) when a car was immersed in the reservoir following a fatal accident during the Down Rally.	Banbridge, Craigavon, Down, Newry & Mourne
29 September 2014	Ballymurphy Road, Belfast (3 properties)	Coliform bacteria contraventions occurred at 3 properties following installation of a new section of main.	Belfast
19 November 2014	Lough Macrory (Population 35,000)	Turbidity, iron & manganese contraventions were reported due to unrepresentative sampling.	Dungannon & South Tyrone and Omagh
27 November 2014	Rathlin SR (Population 300)	A coliform bacteria contravention was reported due to unrepresentative sampling.	Moyle

**Associated Council Area at time of Event.*

Annex 5
Technical Audit Programme

In 2014, the technical audit programme of the public water supplies was satisfactorily undertaken and we acknowledge NI Water's continued co-operation. NI Water has implemented or provided substantive comment on the recommendations and suggestions we provided in our audit reports.

The following table provides a summary of our 2014 Inspection Programme.

Table 5.1: Summary of the 2014 Inspection Programme

Location	Audit Activity	Number of Recommendations[1]	Number of Suggestions[2]
'Laboratory Information Management System' (LIMS)	To check that data is adequately managed by the 'Laboratory Information Management System'	6	0
Belleek WTWs	To check that good practice in the water treatment process is being operated.	4	3

[1]Recommendations are made where, in our opinion, action is required to avoid a foreseeable risk or a breach of a regulatory duty. If such a breach occurs, then we may consider 'enforcement action'. A formal written response from NI Water is required.

[2]Suggestions are made in relation to matters which relate to an aspect of best practice.

Annex 6
Enforcement Orders

Table 6.1 provides a summary of enforcement action taken by us under Section 30, and Section 31(3)(a) of The Water and Sewerage Services (Northern Ireland) Order 2006 and under Regulation 28(4) of the Water Supply (Water Quality) Regulations (Northern Ireland) 2007 (as amended).

On our website you can access full details on each Consideration of Provisional Enforcement Order (CPEO) and Provisional Enforcement Order (PEO) and Regulation 28 Notices issued by us. It details the remedial actions to be completed by NI Water, through:

- Undertakings, which are accepted as part of the CPEO process, or as a requirement under a PEO; and
- Regulation 28 Notices, which are issued through our ongoing assessment of NI Water's risk assessments.

Table 6.1: A Summary of CPEOs closed in 2014

CPEO	Water Treatment Works (WTWs) and Associated Water Supply Areas	Reason for Undertaking/Notice	Progress made in 2014
CPEO/13/03	Clay Lake WTWs and Associated Supply Area	MCPA (Pesticide)	Notice of acceptance of Undertakings letter published 29 August 2013 detailing remedial measures in relation to upgrade of Clay Lake WTWs in relation to the refurbishment, installation and operation of two GAC filters and other operational work. This work was completed on schedule and a 'Completion of Undertaking' notice for the CPEO was issued on the 29 April 2014.
CPEO/13/04	Dunore WTWs and Associated Supply Area	Microbiological	Notice of acceptance of Undertakings letter published 19 December 2013. This details remedial measures in relation to Undertaking a review of the current disinfection procedures within the distribution system and to put in place an action plan to reduce the occurrence of microbiological contraventions at services reservoirs and consumers taps. These actions were completed on schedule and a 'Completion of Undertaking' notice for the CPEO was issued on the 14 November 2014.

Table 6.2: A Summary of PEO/CPEO's and Regulation 28 Notices issued in 2014

CPEO/PEO or Reg 28 Notice	Water Treatment Works (WTWs) and/or Water Supply Areas	Reason for Undertaking/Notice	Progress made in 2014
CPEO/14/01	Dungonnell Glarryford Water Supply Zone. Properties in Straid Road, New Road & Ballymontenagh Road, Ahoghill	pH (national conditions of use of cement lined mains)	Notice of acceptance of Undertaking letter published 16 June 2014. This details the remedial measures in relation to replacing the section of asbestos cement main supplying Straid Road / New Road / Ballymontenagh Road, Ahoghill. The main was replaced on the 12 March 2015. A sampling programme and assessment report are scheduled for completion in 2015.
CPEO/14/02	Camlough WTWs and Camlough Newry West Water Supply Zone	Manganese Contraventions	Notice of acceptance of Undertaking letter published 15 August 2014. This sets out the remedial measures required to ensure that the water supplied into Camlough Newry West Water Supply Zone is compliant with the drinking water quality standard for manganese. NI Water is required to blend the water from this WTWs to reduce manganese levels. This undertaking will be reviewed in August 2015.
Reg28_Notice/ 14/01	Rathlin Island WTWs and Rathlin Island Water Supply Zone	Disinfection Statement	Notice of acceptance of Undertakings letter published 26 September 2014. This sets out the remedial measures in relation to the risk of NI Water supplying water from Rathlin WTWs which may not comply with the minimum requirements to ensure adequate disinfection for water leaving the WTWs. These measures will remain in place until the service reservoir for Rathlin (V1750) has been reassigned as the Clear Water Tank for the WTWs, and a revised disinfection statement has been issued. This work is due for completion in 2015.
PEO/14/01	Drumaroad WTWs and associated Water Supply Area	Loss of Disinfection	Notice of acceptance of Undertakings letter published 12 December 2014, which details the remedial measures in relation to a loss of chlorination at the works. These measures include putting in place appropriate alarms on the storage volume sensors for the duty and stand-by sodium hypochlorite tanks, as well as the provision for an automatic changeover between duty and standby sodium hypochlorite dosing tanks. The Undertakings were completed on schedule and a 'Completion of Undertaking' notice for the PEO was issued on the 14 April 2015.

Annex 7
Private Water Supplies

Private water supplies are defined as any supplies of water provided otherwise than by the water undertaker, namely NI Water. Private water supplies are diverse in nature and range from those which serve single domestic dwellings through to those supplying large commercial and public premises.

As well as establishing a monitoring programme for all registered private water supplies, the Private Water Supplies Regulations (Northern Ireland) 2009 require that a risk assessment is carried out for each supply to identify areas where there may be potential risks of contamination. This assessment includes the whole private water supply system, from source to tap. These assessments are similar to the drinking water safety plans in place for the public water supply.

In the event of a failure, any contraventions of the wholesomeness standards in the regulations must be investigated and followed up to ensure compliance. If compliance cannot be achieved through informal agreement, we can apply more formal mechanisms to secure the required improvement (e.g. Notices). The regulations also contain provision for the issuing of Notices which could be used to restrict the use of a supply in circumstances where there is a risk to health from consuming or using the water.

There is a further requirement in the regulations for any newly installed products or substances, used in the provision of a private supply, to be approved for use with drinking water. Details of approved products are available through the Drinking Water Inspectorate for England and Wales web site.

Roles and Responsibilities

The Drinking Water Inspectorate, acting on behalf of the Department of the Environment, has a regulatory responsibility for private supplies which are used for drinking, cooking, food preparation or other domestic purposes (including personal hygiene); or those used in commercial food production: the manufacture, processing, preservation, or marketing of food or drink for human consumption.

We implement these regulations with the support of staff from the Environmental Health Department of local councils who collect samples, assist in follow-up investigations and carry out risk assessments at private water supplies.

The regulations require that the sampling and risk assessments of private water supplies are undertaken by a competent person. We have a training programme in place for Environmental Health officers carrying out these duties on our behalf. The 'Private Water Supplies Sampling Manual - A Field Guide', published by us in December 2009, provides details of our standardized sampling methods which have been adopted as guidance throughout the UK.

Persons involved in supplying water from a private water source to others, either as a shared domestic supply or through a supply to public premises or a food business, have a duty of care for the safety of the water being provided. They also have a responsibility to take any appropriate remedial actions identified by risk assessment or following an investigation into a failure of the supply to meet the drinking water quality standards.

In addition, we offer advice to owners/users of all private supplies, including those to single domestic dwellings, on action that can be taken to protect human health from the potential adverse affects of a contaminated water supply. An advice leaflet, 'Is your private water supply safe?' (published by us in December 2010) is available on our website or by contacting us.

Register of Supplies

We are required to hold a register of private supplies to which the regulations apply. The owners/users of private water supplies for commercial or domestic purposes, other than to single domestic dwellings, must register their supply with us by completing a Private Water Supplies Registration Form.

Annex 8
Drinking Water Guidance

Drinking Water and Health Guidance

A guidance document, 'Drinking water and health: a guide for public and environmental health professionals and for those in the water industry in Northern Ireland', is available to download from NI Water's website, and was produced through the collaborative working of a cross Departmental Drinking Water Liaison Group. This group has representation from the Chief Environmental Health Officers' Group; the Department of Health, Social Services and Public Safety; the Drinking Water Inspectorate; the Northern Ireland Public Health Laboratory; Northern Ireland Water; and the Public Health Agency.

The purpose of the document is to set out the roles and responsibilities of the different organizations with an involvement in the safety of drinking water, and was revised during 2013.

Guidance on Protection of Drinking Water Sources

This guidance document 'The contribution of Drinking Water Quality Regulations to the implementation of the Water Framework Directive in Northern Ireland' identifies where the requirements of the Drinking Water Quality Regulations complement and support the implementation of the Water Framework Directive. It also provides guidance on practical steps that can be taken to ensure the long-term safety of drinking water supplies. The guidance can be downloaded from our website.

WaterSafe

WaterSafe is a dedicated online search facility, launched on 8th October 2013, to help customers find the nearest qualified plumbing and heating professionals in their area and promote water safety in the home or in businesses. All contractors featured on the WaterSafe website must be a member of an Approved Contractors' Scheme, ensuring that they provide a quality service.

WaterSafe is supported by government and all UK water quality regulators.

Guidelines for drinking-water quality

The World Health Organization (WHO) publication 'Guidelines for drinking-water quality' (fourth edition) provides detail on the significance, occurrence and removal of microbial and chemical hazards in drinking water, and the preventive risk management approach for ensuring drinking water quality.

Water Safety in your Home

Water UK has produced a consumer's guide to show how to keep water in your home in top condition and avoid potential problems which could cause taste and quality: Looking after water in your home (.pdf 4.82MB)

Water Safety in Buildings

The World Health Organization (WHO) publication 'Water Safety in Buildings' provides guidance for managing water supplies in buildings.

Private Water Supplies Technical Manual

This Manual provides comprehensive guidance for owners/users along with other general information relating to private supplies.

Annex 9
Useful Contacts

Drinking Water Inspectorate for Northern Ireland

The Drinking Water Inspectorate (DWI) is responsible for regulating drinking water quality in Northern Ireland.

Web address: www.doeni.gov.uk/niea/water-home/drinking_water.htm

Tel: +44 (028) 9056 9282

E-mail: dwi@doeni.gov.uk

Address: Drinking Water Inspectorate
Northern Ireland Environment Agency
Klondyke Building
Cromac Avenue

Northern Ireland Water Ltd (NI Water)

NI Water is responsible for providing all public water supplies and sewerage services in Northern Ireland.

Web address: www.niwater.com

Tel: 03457 440088

E-mail: waterline@niwater.com

Address: Northern Ireland Water Ltd
PO Box 1026
Belfast BT1 9DJ

Utility Regulator

As the independent economic regulator of NI Water, the 'Utility Regulator' focuses on ensuring that consumers receive value for money water and sewerage services.

Web address: www.uregni.gov.uk/water

Tel: +44 (028) 9031 1575

E-mail: info@uregni.gov.uk

Address: Queens House
14 Queen Street
Belfast BT1 6ED

Local District Councils

District council's Environmental Health Departments can be contacted if you have a private water supply serving a single domestic dwelling.

Web address: www.nidirect.gov.uk/index/contacts/local-councils-in-northern-ireland

Consumer Council for Northern Ireland (CCNI)

The Consumer Council represents consumers on water and sewerage matters.

Web address: www.consumercouncil.org.uk

Tel: +44 (0) 28 90251600(Enquiries) or
0800 121 6022 (Complaints)

E-mail: info@consumercouncil.org.uk or
complaints@consumercouncil.org.uk

Address: The Consumer Council, Seatem Hse,
28-32 Alfred Street, Belfast BT2 8EN

Northern Ireland Environment Agency (NIEA)

NIEA has a duty to maintain or improve the quality of surface and underground waters in Northern Ireland.

Web address: www.doeni.gov.uk/niea/

Tel: +44 (028) 9262 3100

E-mail: waterinfo@doeni.gov.uk

Public Health Agency (PHA)

PHA has responsibility for a range of functions, including: improvement in health and social wellbeing; health protection; and supporting commissioning health and social care services.

Web address: www.publichealth.hscni.net

Tel: 0300 555 0114

Address: Public Health Agency
Linenhall Street Unit
12-22 Linenhall Street
Belfast BT2 8BS

Food Standards Agency (FSA)

FSA protects the public's health and consumer interests in relation to food, including the use of water in food production.

Web address: www.food.gov.uk/northern-ireland/

Tel: +44 (028) 9041 7700

E-mail: infofsani@foodstandards.gsi.gov.uk

Address: Food Standards Agency NI
10A-C Clarendon Road
Belfast BT1 3BG

DWI (England and Wales)

DWI provides independent reassurance that water supplies in England and Wales are safe and drinking water quality is acceptable to consumers.

Web address: www.dwi.gov.uk
Tel: +44 (0)30 0068 6400
E-mail: dwi.enquiries@defra.gsi.gov.uk

Drinking Water Quality Regulator (DWQR)

DWQR exists to ensure that drinking water in Scotland is safe to drink.

Web address: www.dwqr.org.uk
Tel: +44 (0)131 244 0190
Address: DWQR
Area 1-D South, Victoria Quay
Edinburgh EH6 6QQ

Environmental Protection Agency (EPA)

EPA is a statutory body responsible for protecting the environment in Ireland.

Web address: www.epa.ie
Tel: +353 (0) 53 916 0600
E-mail: info@epa.ie

Water UK

Water UK is the industry association that represents all UK water and waste water service suppliers at national and European level.

Web address: www.water.org.uk/home
Tel: +44 (0)207 344 1844
Address: Water UK head office
1 Queen Anne's Gate
London SW1H 9BT

UK Water Industry Research (UKWIR)

UKWIR facilitates collaborative research for UK water operators. The UKWIR programme generates sound science for regulation and practice.

Web address: www.ukwir.co.uk
Tel: +44 (0)20 7152 4537
E-mail: mail@ukwir.org.uk

Foundation for Water Research (FWR)

FWR shares and disseminates knowledge about water, waste water and research into related environmental issues.

Web address: www.fwr.org
Tel: +44 (0)162 889 1589
E-mail: office@fwr.org.uk

Water Regulations Advisory Scheme (WRAS)

WRAS is an advisory scheme which aims to promote knowledge of the water regulations throughout the UK.

Web address: www.wras.co.uk
Tel: +44 (0) 333 207 9030
E-mail: info@wras.co.uk

The Health and Safety Executive for Northern Ireland (HSENI)

HSENI is the lead body responsible for the promotion and enforcement of health and safety at work standards in Northern Ireland.

Web address: www.hseni.gov.uk
Tel: 028 9024 3249
E-mail: mail@hseni.gov.uk
Address: 83 Ladas Drive
Belfast
BT6 9FR

World Health Organization (WHO)

WHO produces international norms on water quality and human health in the form of guidelines that are used as the basis for regulation and standard setting, in developing and developed countries.

Web address:
www.who.int/water_sanitation_health/dwq/en/
Information Request:
http://www.who.int/about/contact_form/en/

References

Abstraction Licensing Regulations
www.legislation.gov.uk/nisr/2006/482/contents/made

Code of Practice for using Plant Protection Products (DARD)
www.dardni.gov.uk/cop-plant-protection-final.pdf

Drinking Water Guidance
www.niwater.com/drinking-water-guidance/

DWTS (Drinking Water Testing Standard)
www.ukas.com/library/Technical-Information/Pubs-Technical-Articles/Pubs-List/LAB37%20Edition%203%20Jun%2013%20final.pdf

Enforcement and Prosecution Policy
www.doeni.gov.uk/niea/dwi_prosecution_policy_-_march_2012.pdf

EU Priority Substances
http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm

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http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:296:0012:0021:EN:PDF

Guidelines for drinking-water quality (fourth edition) WHO
www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/

BS 8558:2011: Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their cartilages

List of Approved Products for use in Public Water Supply in the United Kingdom
http://dwi.defra.gov.uk/drinking-water-products/approved-products/soslistcurrent.pdf

The Plan Protection Products (Sustainable Use) Regulations 2012
www.legislation.gov.uk/uksi/2012/1657/made

The Plant Protection Products (Sustainable Use) Regulations (Northern Ireland) 2012 -
www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/Plant_Protection_Products_(Sustainable_Use)_Regulations_2012.pdf

Private Water Supplies Enforcement and Prosecution Policy
www.doeni.gov.uk/niea/water-home/drinking_water/private_water/enforcement.htm

Private Water Supplies Sampling Manual: A Field Guide
www.privatewatersupplies.gov.uk/private_water/files/PWS_sampling_manual.pdf

Private Water Supplies Technical Manual
www.privatewatersupplies.gov.uk/private_water/files/Full%20Doc.pdf

River Basin Management Plans
www.doeni.gov.uk/niea/water/wfd.htm

Water Hardness Map
www.doeni.gov.uk/niea/water-home/drinking_water/consumer/water_hardness.htm

The Water Regulations Advisory Scheme
www.wras.co.uk/

Water Resource Management Plan
www.niwater.com/managing-northern-irelands-water-resources

Water Safety in Buildings (WHO)
www.who.int/water_sanitation_health/publications/2011/9789241548106/en/

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Did you find what you were looking for?

The Drinking Water Inspectorate is constantly aiming to improve the standard of information provided in this report; our Annual Drinking Water Quality Report is designed to provide clear information and statistics detailing the quality of drinking water supplies in Northern Ireland.

Any views or opinions you may have would be highly valued by us and we would greatly appreciate your feedback.

For your convenience we would encourage you to provide feedback by either

Email: **dwi@doeni.gov.uk**

or

Post: **Drinking Water Inspectorate**
Northern Ireland Environment Agency
Klondyke Building
Cromac Avenue
Gasworks Business Park
Malone Lower
BELFAST
BT7 2JA

Northern Ireland Environment Agency
www.doeni.gov.uk/niea

Create prosperity and well being through environment and heritage excellence.

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